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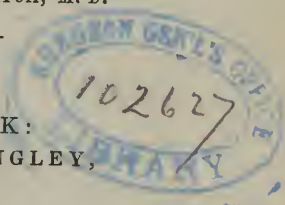
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THE
YOUNG STETHOSCOPIST,
OR THE
STUDENT'S AID
TO
AUSCULTATION.

BY HENRY I. BOWDITCH, M. D.

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TO
JAMES JACKSON, M. D.

Whom, in the earliest hours of my Medical Life, it
was my Good Fortune to call

FATHER IN MEDICINE,

And to whom, during the years of my Professional
Practice, it has been my Happiness to look as

COUNSELLOR AND FRIEND,

THIS LITTLE WORK IS GRATEFULLY

Dedicated.



TO THE
STUDENT OF AUSCULTATION.

FOR you have I prepared this book on physical diagnosis. In its preparation I have endeavored to be concise, yet clear and comprehensive. Its name indicates its object; viz. : to give you, in a compact form, a complete view of what are technically called the physical signs. But I have had another, and perhaps equally important end in view, viz. : to make you feel that the *time*, the *place*, the *circumstances* in which you may meet with these morbid signs, and the relations which they bear to the rational signs, are of as much importance as the physical signs themselves. There have been, I think, too many minute distinctions in regard to the particular sounds, a diffuseness of detail that has served to discourage rather than to allure you onward in the study of the interesting art of auscultation.

But this book is not intended to supersede many others of a more elaborate character. I have prepared it as a pocket companion merely ; a kind of summary of the essentials of auscultation, the details of which you will find more fully displayed in other and higher works. Among these last, there are many to which I am indebted. The immortal labors of Laennec are the fountains whence have flowed all subsequent writings on the subject. To the numberless host of his followers, I have endeavored to give due credit, whenever I have borrowed any ideas from them. Nevertheless, the greater part of the book, at least so far as it relates to the thorax, is a transcript of my own mind, as it has formed its opinions during the experience of several years' practice. To Hope, Bouillaud and Pennock I owe much on diseases of the heart ; to Fisher, Whitney and Smith is due almost all I have given on cephalic auscultation ; from Drs. Cammann and Clark's publications has arisen the article on auscultatory percussion ; on obstetric auscultation, I have consulted freely the invaluable work of Dr. Kennedy ; and from the writings of Youatt and Percival, I have drawn my accounts, meagre though they may be, of veterinary auscultation. I cannot forbear stating in this connection how much I owe on this subject to my former preceptor and kind friend, Louis. It was in his wards, at La Pitié, that

I first caught a love for physical and rational diagnosis, as a means of cultivating the higher faculties of the mind, which I trust I shall ever carry with me.

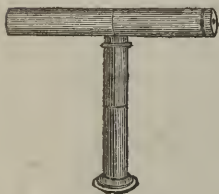
In conclusion, while presenting this little work on the physical signs, let me disclaim all intention of placing them higher than they really deserve. Fifteen years ago, they were sneered at by many persons. Now, very few would be foolish enough to do so, and the tendency is strong to overrate them. Amidst the niceties of our physical examinations we are apt to neglect the rational signs. The truth is, that he who scoffs at either must necessarily be a child in the diagnosis of not a few diseases ; and he who cultivates both with the clear, keen-sighted eye of a true observer, and then notes their mutual relations, is the truly wise physician. Both categories of signs are useful, each in its own sphere ; and neither should be allowed to predominate ; neither should be neglected.

H. I. B.

Boston, 1846.

THE
YOUNG STETHOSCOPIST.

PRELIMINARIES ABSOLUTELY ESSENTIAL TO AN ACCURATE EXAMINATION OF THE PHYSICAL SIGNS OF DISEASES OF THE CHEST; AND WITHOUT STRICT ATTENTION TO WHICH, NO ONE CAN BECOME AN ACCURATE AUSCULTATOR.



THE patient must have the chest wholly uncovered, or be clothed with a thin, single dress. If possible, let him sit or stand; but if this be impracticable, let him lie *perfectly flat* on his back : inasmuch as a pillow, supporting one shoulder and not the other, may change the character of the sound produced by percussion, and also the respiratory murmur. If we cannot attend to these rules, we must be cautious of our inferences from *any* examination, however accurately we may *apparently* make it.

1. The following Plates show the best positions for examining the front, back, and sides of the chest.

Fig. 1.

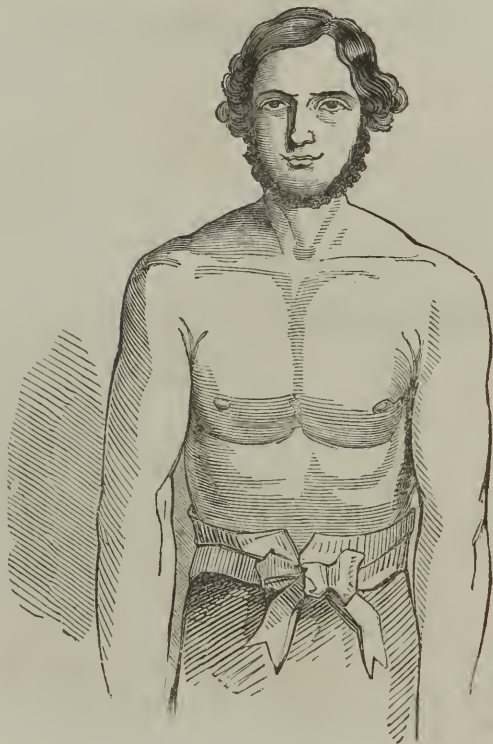


Fig. 2.



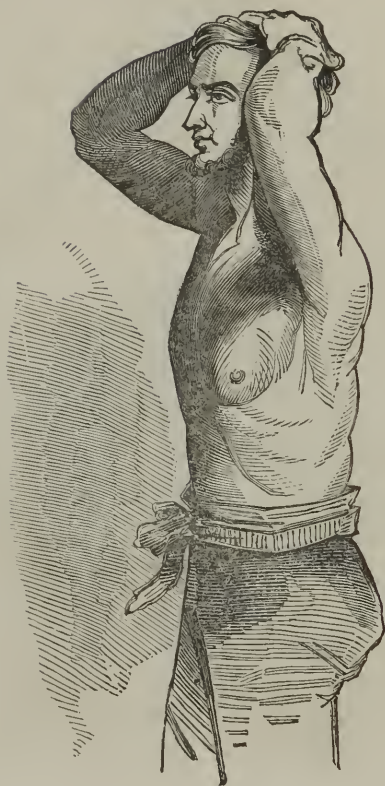
Fig. 3.

Fig. 1. This position is the best for the front and the tops of the shoulders. Let the arms fall easily by the sides of the body, and let the body be erect and firmly poised.

Fig. 2. In this position, (which is that to be assumed when the back is to be examined) the scapulæ are drawn forward, making the whole back tense, and more resonant than in figure 1. Let the arms be clasped firmly in front, and the head and neck be bent forward, so that a regular curve is formed by the dorsal and cervical vertebræ.

Fig. 3. This position is rarely needed, except in the examination of the axillæ. Let the palms of the hands rest lightly on the vertex.

2. In the acts of auscultation and percussion, always compare one lung with the other, and one part of the lung with the corresponding part of the other.

3. N. B. The above is a most important rule; and, in order to follow it accurately, I measure with my eye equal distances laterally from the median lines of the sternum, and of the spinous processes of the vertebræ; and vertically from the clavicles, the tops of the shoulders, the spines of the scapulæ, &c.

4. EXAMPLES. Strike upon the sternal end of

one clavicle and on the acromial end of the other, and observe the difference. Again; try the difference between the sound on percussion over the lower angle of one scapula, and that heard on a spot an inch or two below the same angle of the other scapula. Similar examples might be cited with reference to the respiration and the voice.

5. This rule is especially necessary in cases where there is only *a difference of note*, and no real dullness on percussion, a fact which occurs not unfrequently in the earlier stages of phthisis.



INSPECTION.



INSPECTION, as a method of examination, is of some moment; but it is of very little use when compared with other more marked signs that may be present. The two sides of the chest are rarely symmetrical, even in the most healthy persons: the right, according to some writers, being larger than the left, by half an inch. The pulsation of the heart not uncommonly causes a slight prominence over the præcordial region. The slightest lateral curvature of the spine will make one side

more prominent, and one shoulder higher than the other. This last cause of want of symmetry is almost universal, and is perceptible at a glance. To examine, by inspection, *thoroughly*, the chest must be naked.

7. Diseases cause great changes in the results of inspection.

8. EXAMPLES OF DILATATION. An old man, long affected with asthma, usually has more or less general emphysema, or dilatation of the air-vesicles. In him we find, *commonly*, the chest more rounded than usual ; the intercostal spaces, even with, or perhaps projecting beyond the ribs ; the clavicles scarcely to be seen, owing to the prominence of the adjacent soft parts. Usually these appearances are more manifest over one lung than the other. Acute pleuritic and pericardial effusions cause dilatations. The former may enlarge the whole of one side of the chest ; the latter, of course, is limited to the left breast. Malignant tumors, causing enlargement of the thorax, are very rare. Aneurism of the aorta may press out through the sternum, or behind between the vertebræ and scapulæ. (*See Aneurism, Fig. 34.*)

9. EXAMPLES OF CONTRACTION. An old pleurisy with thick membranes will contract a whole side, so that the shoulder will fall, the scapula become more prominent and lower, and the intercostal

spaces concave. Phthisis, with partial pleurisy covering the apex of either lung, causes contraction about the clavicle, so that the latter stands out more prominent than usual.

10. TO OBSERVE THE MOTIONS of the chest is very necessary, especially in children. Great motion of the muscles of the neck, or abdomen, either with or without increased motion of the respiratory muscles, is always a serious symptom. It occurs in severe, acute inflammations of the larynx, bronchi, or substance of the lung, in severe attacks of asthma, and in pneumothorax. A labored breath is observed in acute phthisis. Absence of motion of the chest is observed generally on the diseased side in pneumothorax, pleuritic effusion ; and locally in chronic phthisis. A permanently distended condition, without motion, of the parietes, is seen in emphysema, with forcible compression of the intercostal spaces in expiration. A pulsation, perceptible in a part, may indicate enlarged heart, or aneurism, &c.

11. EXAMPLES. In laryngitis of adults, and croup in children, the most violent motions of the cervical respiratory muscles are observed. Their object is to open, as far as possible, the passage which is gradually closing. A severe pneumonia, or a pleuritic effusion, or pneumothorax, of one side, will cause active motions of the muscles of

the other, and, for similar reasons to those just mentioned, viz. : one lung being put out of use, the other is obliged to labor harder in order to perform the respiratory function. Sometimes the abdominal muscles only perform the respiratory movements. This is usually a serious symptom, for it indicates that there is severe acute disease on both sides of the thorax. The labored breath of acute phthisis is owing to the sudden development of miliary granulations throughout both lungs, and is marked by panting and frequent motion of the chest, rather than by any very distressed movements, such as are observed in pneumothorax, double pneumonia, &c.

12. N. B. This breathlessness of acute phthisis is one of the most marked signs of the disease ; and, if combined with a very rapid pulse in an obscure febrile disease, is almost pathognomonic of the affection. A pulsation and a lifting-up of the parietes of the left breast is very common in hypertrophy of the heart. Aneurism generally shows itself by slight pulsations at the upper part of the sternum. Rarely do we find the same amount of motion when the disease protrudes behind.

13. EXAMPLES OF DIMINISHED MOTION. Chronic phthisis, by the adhesions consequent thereupon, causes a diminution of motion of the upper ribs of the diseased side. Pneumothorax, and great

pleuritic effusion, would, of course, cause the same effect throughout the whole of a diseased side. Effusion into the pericardium destroys the usually perceptible impulse of the heart.



PALPATION.



PALPATION of the chest is the application of the hand or finger to the parietes, for the purpose of recognizing the health or disease of the thoracic viscera. A slight tremor may be felt in health, at all times, by any one, if he applies his hand to the chest while speaking or coughing. This is modified by disease. It is augmented by the hepatization of pneumonia, by a tuberculous cavity communicating with the bronchi; it is diminished by pleurisy, with effusion of fluid, and by tumors. The sonorous and crackling râles and the rubbing sounds are sometimes felt by the physician, and very frequently by the patient. A peculiar thrill, called *fremissement cataire* by the French, similar to that perceived on placing the ends of the fingers upon

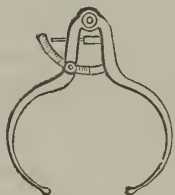
the chest of a cat when she is purring, is felt at times over aneurisms, and in some affections of the heart, that cause obstruction to the passage of the blood. The impulse of the heart is likewise perceived by the hand, but more distinctly by the ear and head, and still more distinctly by the ear, armed with a stethoscope. This likewise is varied by diseases. Fluctuation may very rarely be felt in the case of a fluid in the cavity of the pleura, and in this case the natural tremor on speaking is diminished, if not wholly destroyed.

15. N. B. This method of exploration is of so little importance; it conveys so little real knowledge, except, perhaps, with reference to the operation of paracentesis thoracis, that very little use is made of it. The thrill of the voice, the rales, the rubbing sound, the *purring* sensation, &c., are most distinct to the ends of the fingers, placed lightly on the part. They are all dependent on one cause, viz.: the passage of air or fluid underneath, and the vibrations consequent thereupon.

MENSURATION.



ENSURATION, as the name denotes, is merely the admeasurement of the different parts of the chest, but usually it does not indicate much more than the eye readily perceives, and this latter discovers what admeasurements never would. It is used in pleurisy, with recent effusion, hydrothorax, emphysema, phthisis, pneumonia, disease of the heart, pneumothorax, &c. The dimensions of one side of the thorax may be compared with the other, by means of a tape passed around the chest at different distances from the apex of the lungs. We must notice the

Fig. 4.

position of the nipples in reference to the middle of the sternum, the clavicles and the spinous processes of ilia. The position of the scapula with regard to the vertebræ and ilia, and the thickness of the two lungs from front to back should be observed. For these purposes some use callipers. *Fig. 4.*

17. EXAMPLES. Hydrothorax, and pleurisy with effusion of fluid, enlarge the diseased side some-

times more than an inch. Frequently, however, inspection discovers a great difference, when the tape does not give so much real enlargement. In this same case, the nipple of the diseased side is raised towards the clavicle and thrown out from the sternum; whereas, in chronic pleurisy, with contraction of the side, exactly the reverse takes place. The scapula, in chronic pleurisy, falls towards the vertebræ. The contraction over the apex of a tuberculous lung may be recognized by the instrument. Inspection does the same, perhaps, nearly as well. One late French writer proposes a spring made of steel, to measure the arc of the circle formed by the prominence from a diseased heart.



AUSCULTATION.



AUSCULTATION may be *mediate*, or by means of a stethoscope; it may be *immediate*, or by means of the ear applied directly to the chest. Laennec thought the whole art rested on the stethoscope. All tyros in auscultation discuss the relative merits of the numerous stethoscopes. Adepts do not discard the instrument, for in some cases they find it useful, but in the

vast majority of instances of disease, the ear is sufficient. I find a stethoscope needed in most diseases of the heart, when I am desirous of making an accurate diagnosis; in obstetric auscultation, and finally in deciding the relative condition of two small spaces of one or both lungs. All I seek in a stethoscope are lightness, smallness, and a good-sized ear-piece.

19. The following figures give an idea of some of the common forms of the instrument. *Fig. 5* is copied from the stethoscope originally used by

Fig. 5. Laennec. It is divided into two parts, (*fig. 6*) for the purpose of shortening it if necessary, and has a plug at its lower extremity; which was thought necessary for the examination of the heart and the sound of the voice. The instrument is wholly obsolete, being altogether too heavy and unwieldy. *Fig. 6.*






20. *Figs. 7, 8, 9, & 10*, contain Piorry's stethoscope. *Fig. 7* shows it prepared *Fig. 8.*



for auscultation. *Figs. 8 & 9* represent its various parts separated; *fig. 8* being the shaft of the instrument; *fig. 9, a*, being an ivory ear-piece, pierced with a screw to fasten it to the upper part of the



shaft; *b*, a plessimeter, (see plessimeters) which can be screwed to the bottom of the same; *c*, *Fig. 9.* the plug to be used as in Laen- *Fig. 10.*
a  nec's instrument. *Fig. 10* rep-
b  represents it in a portable form, the
c  ear-piece being screwed upon the
 bottom of the plessimeter. This
 is a convenient form, but the ivory
 edge at the bottom of the shaft
 is apt to hurt the person who is
 ausculted. The plug likewise is found to be un-
 necessary.

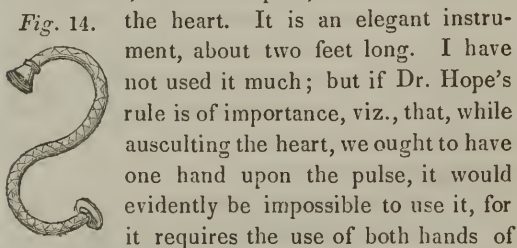


21. *Figs. 11, 12, & 13* present a very conve-
 nient form proposed by Dr. Bige-
Fig. 11. low, of this city. *Fig. 11* shows *Fig. 13.*
 the instrument. It is wholly of
 soft wood. The ear-piece is broad,
 so that its side may be pressed on
 the chest and used as a plessi-
 meter. *Fig. 12* is a worsted ball,
 covered with velvet, through which
 a slender but firm handle of ebo-
Fig. 12. ny passes. This is used as a
 percussor, instead of the tip of the finger,
 in order to avoid the click of the nails,
 which sometimes causes a confusion of
 sounds. *Fig. 13* represents the instru-
 ment in its portable condition. This



stethoscope is very convenient for auscultation. As an instrument for percussion, I use it, at times, behind the clavicle, but even there I prefer a piece of caoutchouc, and my own fore-finger.

22. *Fig. 14* is the flexible stethoscope used by Dr. Pennock, of Philadelphia, for the sounds of



the auscultator. A similar one is used by Dr. Golding Bird, of London.

Fig. 15. 23. *Figs. 15 & 16.* These plates are intended to represent the solid stethoscopes used by Drs. Cammann and Clark, (see Auscultatory Percussion.) They are made of soft wood. *Fig. 15* is a cylinder, about six inches by three-quarters of

Fig. 16. an inch; the other, (*fig. 16*) is like a cylinder of the same dimensions, made wedge-like, in order that the narrow part may be placed on the soft parts between the ribs. (*Appendix, A.*)



AUSCULTATION OF THE RESPIRATION.



RESPIRATORY MURMUR. This is a very delicate, breezy sound, which is heard, on application of the ear to the chest; chiefly during inspiration; very little in expiration.

25. This sound is influenced by age: it is loud in childhood, hence called *puerile*; more indistinct in adult and old age.

26. By position: for example, a constrained posture, causing contraction of the muscles of the chest, of course prevents a full expansion of the lungs, and diminishes the sound.

27. By temperament: frequently it is scarcely heard in a full sized healthy man, while it is very distinct in one who breathes more quickly, and is of a more active temperament.

28. By diseases: one lung when diseased may cause puerile murmur in the other; for example, pneumonia, pleurisy, pneumothorax, tumors, &c., that prevent one lung from acting, stimulate the other to the puerile respiration. So, likewise, if one part of a lung is filled with tubercles, or is otherwise obstructed, those parts that are healthy, usually have puerile respiration; any cause, in fact,

which puts suddenly out of use a large part of either lung, will diminish or destroy the sound in one part, and increase it in another. Emphysema diminishes it (178); pleurisy may destroy it (132).

29. By the part of the chest which is examined : the vesicular murmur is generally stronger at the lower portions than above, and frequently is very distinct throughout the whole of the back when it is heard with difficulty in front ; and *vice versa* ; yet the person may be entirely healthy, and there will be no sufficient explanation of the fact. In such cases we must remember to compare, with great accuracy, corresponding parts of the two lungs, and the natural differences that exist between them. (2, 33.)

30. By emotions of the mind : if a child be frightened and cries, all sound for a time is prevented ; in some nervous females, it is sometimes impossible to hear any sound.

31. By rapidity of breathing : the respiratory murmur becoming louder with increase of frequency.

32. By the action of the heart : agitation of the mind or organic disease may cause such loud sounds of the heart as to obscure the respiratory murmur.

33. By any injury whereby the muscles of the chest are prevented from acting freely : for ex-

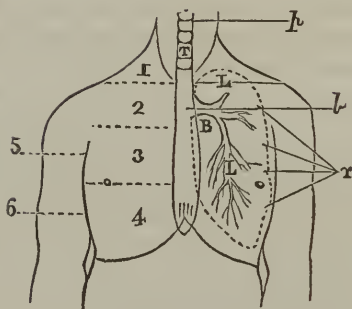
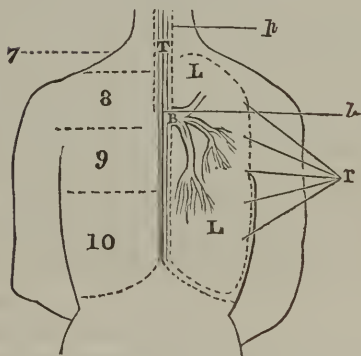
ample, I saw a man whose arm had been torn off by machinery, and the cicatrix had contracted so much that that side of the thorax could not dilate; and a diminution of the sound of respiration was the consequence.

34. Though usually the expiration is slight, except as described (38), it is equally important with inspiration as a means of diagnosis.

35. The ratio of the length of inspiration to that of expiration should be carefully studied, it being in the healthy lung as ten to two (46).

36. Any disease that condenses the lung causes a change in this ratio; for example, pneumonia or tubercles, with condensation of the lungs. The inspiratory murmur is usually first changed and rather diminished in length, while the expiration is soon prolonged. When perfect hepatization from pneumonia occurs, the sounds are frequently of the same length and of the same character. (41, 46, 122.) In dilated bronchi likewise, we frequently find the expiration prolonged.

The annexed figures will be occasionally referred to, and therefore are introduced here.

Fig. 17.*Fig. 18.*

The figures 1, 2, &c., to 10, mark arbitrary divisions of the thorax.

1. Post clavicular space.

2. From clavicle to 2d rib.

3. " 2d rib to 4th "

4. " 4th " to base of breast.

5 & 6 divide the sides into two equal parts, below axilla.

7. Top of shoulder.

8. From top to spine of scapula.

9. From spine of scapula to lower angle of do.

10. From lower angle of do. to bottom of back of chest.

..... Projection of the outlines of the lung L.

T. Trachea, over which is heard in health, tracheal or cavernous respiration with pectoriloquy.

B. Large bronchial tubes, over which are heard in health, bronchial respiration and bronchophony.

r r. Points upon the superficies of the lung, and remote from B; vesicular respiration is heard there, with the natural, slight resonance of the voice.

37. REMARKS. Nos. 1, 2, & 7, are very important, in cases of suspected phthisis; 3 & 4, on the *left* side, in suspected disease of pericardium and heart; 9 & 10, in cases of pleurisy, and most generally of pneumonia. (143, 117, 128, 258.)

38. There is naturally a *prolonged* expiration in some persons, at the top of the right lung in 1 & 2, in front, and in corresponding parts be-

hind, owing to the fact that the right primary bronchus is larger and shorter than the left. The

Fig. 19. adjacent figure shows the reason for this increased length of the left primary bronchus. The aorta crosses it just as the arch turns, and consequently the lung is put farther off. The plate represents the posterior view of the various parts. But when a *prolonged*



expiration is heard elsewhere, it is always morbid, and is an important indication of disease.

39. A *natural bronchial* or *tubal* sound of respiration is found in health at the *union* of the regions marked 2 in front and 8 behind. The air seems passing through a, more or less distant, tube.

40. N. B. Study this sound thoroughly on children, and thin adults, upon whom it can be heard more distinctly than on others. Thus you will be prepared for recognizing it in diseases in which it may be heard in any part of the chest. It is heard more distinctly behind than in front.

41. *Bronchial* respiration is produced by any disease which affords a medium better capable than the soft air-cells are of transmitting the sound of the bronchial tubes. It then becomes the *Bronchial respiration* of Laennec. It is most

perfect in hepatization from pneumonia; less so, in effusion of fluid into the pleura; in tubercular condensation, dilatation of the bronchial tubes, gangrene of the lung, tumors, either of the lung or arteries: as, for example, schirrus of the lung, or aneurism of the aorta, or of its great branches.

42. *Cavernous or tracheal respiration* is only an increase of the bronchial, and is usually more limited than this last. It is heard over cavities in the lung communicating with the bronchial tubes: tubercular cavities, for example; also over those arising from gangrene, from pneumonia, or from dilatated air tubes. On the healthy body, listen to the air entering the trachea, and you will hear *natural cavernous or tracheal respiration*.

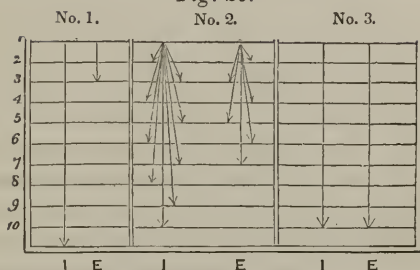
43. *Rude respiration* is a mingling of the vesicular and bronchial; it is less expansive and perhaps rougher than the former, while it has usually more expiration; but it is not distinctly *tubal*, which marks it as different from the bronchial. It is usually heard over a part of the lung in which there are some tubercles interspersed with healthy lung. We hear it in the earlier and later stages of pneumonia, before and after hepatization; in fact, under any circumstances which make the lungs a better conductor of sound, while at the same time the air is still able to enter the cells. (118, 151.)

44. *Amphoric respiration* is merely a peculiar species of the cavernous, heard over a cavity with thin tense walls. It is most distinctly heard in some cases of pneumothorax, where the bronchi communicate with the pleural sac. Also in tubercular and other cavities. It has a peculiar ring, which may be imitated by getting an assistant to breathe with some force into one extremity of a common glass lamp chimney, while the other is pressed against the palm of your hand, the back of which rests upon your ear. (158, 164.)

45. *Wavy or jerking respiration*. This usually does not indicate very much, save some slight obstruction to the passage of air into the lung, whereby the respiratory murmur becomes apparently broken, instead of being one continuous expansion. In one case it may be of infinite importance, and almost the only physical sign, viz.: when it is heard in a very limited spot at the apex of either lung in a chronic case of pulmonary disease; while throughout the remainder of the lung no morbid sound is heard. (110, 149.)

46. The adjoined diagram shows, in a general manner, the relative differences that appear in the inspiration and expiration in health and disease. The diagram is divided into three compartments, by three vertical lines, marked by 1, 2, 3, and each of these into ten smaller divisions,


Fig. 20.



by lines at right angles to the latter, marked by 1, 2, 3, &c., to 10. Compartment No. 1 shows the natural vesicular respiration, in the healthy lung, in which the inspiration is to the expiration as ten to two. Compartment No. 2 shows some slight, more or less perfect, solidification of the lung, from tubercles, pneumonia, &c. The arrow-points, resting on all the various lines, indicate the various changes that occur in either parts of the respiratory act. No *definite* decision can be arrived at from these changes, but of course the more the vesicles become obstructed, the less will the inspiratory sound be heard, until the tubal becomes manifest. Compartment No. 3 indicates complete solidification from pneumonia, or from a cavity, in both of which the two acts are nearly identical in length and in their *tubal* character.



AUSCULTATION OF THE VOICE.

TUDY carefully, in every case, the results obtained from the examination of the voice; for it affords not merely signs peculiarly its own, but, in certain cases, brings out to distinctness a bronchial or tubal sound, which is not heard during the respiratory act. For example: in some cases of pneumonia, and tubercular condensation, the bronchial respiration is wholly imperceptible during the common act of respiration, but it becomes very evident, in the form of a slight blowing, after each slowly-spoken word.

As in the auscultation of the respiration, so we hear certain sounds of the voice which are perfectly normal, while confined to their proper situations, but which indicate disease when heard elsewhere. In proof: I would cite bronchophony and pectoriloquy, both of which may be *natural* or *diseased*. This will become more evident by the perusal of the following.

47. Over the trachea we hear *natural pectoriloquy*. It corresponds, in place, to the natural tracheal respiration. Fig. 17, at page 20, (42.)

48. At the union of the regions marked by 2, in front, and by 8, behind, we hear *natural bronchophony*. It corresponds, in place, to the natural bronchial respiration. (39.) *Figs. 17, 18.*

49. In health there is very little resonance in other parts of the chest; *figs. 17, 18*; *vesicular resonance* it may be styled.

50. The resonance of the voice is affected by the same causes that may modify the healthy respiratory murmur. (25, &c.)

51. *Bronchophony* is heard in any disease which causes condensation of the air-cells, but allows the sound from the tubes to be transmitted. Its intensity varies; being either so slight that it can be discovered only by the minutest comparison between the sounds produced by both lungs; or it may almost equal pectoriloquy. It is heard most purely in hepatization from pneumonia, in dilated bronchi, sometimes in pleurisy; less distinctly in phthisis, gangrene, tumors, &c. (122, 158.)

52. *Pectoriloquy*, or the highest resonance, may be heard over a *cavity* in the lung from any cause: tubercular disease, pneumonia, gangrene, or dilated bronchial tubes. (125, 158, 172, 188.)

53. It is not always equally perceptible, hence the division into *perfect*, *imperfect*, and *doubtful*. Too much mucus may obstruct a bronchus, and cause these variations. (158.)

54. *Hægophony*, or goat-like resonance, occurs in some cases of pleurisy, when a thin layer only of fluid is between the ear and the surface of the lung. Hence it is thought to be an important sign in pleurisy. It indicates, when heard perfectly in the earlier stages, that there is little fluid effused. When it occurs after a severe attack, and during which the sound was absent, it shows that there is a diminution of the amount of fluid effused.* Its peculiar characteristic is sharpness of tone. By compressing the nostrils and speaking quickly in a high key, you will get sometimes very perfect hægophony, especially if your voice incline to be somewhat treble in its tones. This is the mode whereby Punch produces his peculiar voice, and Laennec compares this sound to his tones. (135.)

55. Pure hægophony is rarely heard; but some *modification of the voice*, between hægophony and bronchophony, is always heard in pleurisy; and this I conceive to be more important than the hægophonic character itself. Another fact which makes hægophony less valuable is this: it is heard

* This in general is true; but I have obtained a *modification of the voice*, resembling hægophony or bronchophony, in some cases in which the pleura was filled with fluid.

at times when there is merely a membrane covering the pleura, &c.

56. *Diminished* resonance of the voice is much less common than some modification of its tone, or increase of its resonance; still I have met with it in some early cases of phthisis, emphysema, &c. It may be remembered. (152, 179.)

57. Finally: it is of no importance for the pupil to trouble himself to decide, definitely, whether he hears *bronchophony*, *hægophony*, or the various kinds of *pectoriloquy*. It is sufficient that, on a comparison between the lungs, he finds an *increased* or *diminished* natural resonance in any part. The other physical and rational symptoms, when combined with even these, apparently, doubtful signs, will enable him to arrive at a correct diagnosis. He must, however, bear in mind the different sizes and shapes of the two primary bronchi (*fig. 19*); which facts usually cause *a little more vocal resonance at the top of the right lung*, than at the top of the left lung.

58. GENERAL REMARKS. In examining a patient for the respiration or voice, we must, in order to be very accurate, remember the rules above given. (1, 2, 25, &c.)

RALES, OR RHONCHI.



DURING inspiration, and more rarely during expiration, are heard, in several diseases, certain sounds; called râles, rhonchi, or rattles. They are various in their qualities, and they may be heard in all parts of the chest: some are more or less permanent, while others are very volatile. At times, some of them are brought to existence only by coughing, or by a long inspiration; in other cases, they may be, with equal ease, destroyed by the same acts. They *always* indicate disease; but this disease may vary from the slightest swelling of a bronchial membrane, up to the ulceration and destruction of an entire lobe of one lung.

59. This class of phenomena never occurs in health; it always indicates disease.

60. There are two great divisions: 1st, those sounds produced in the bronchial tubes, or in the cavities connected with them; 2d, those connected with the pleuræ, and unconnected with the tubes.

61. The first of these divisions may be subdivided into (a) canorous or musical tones, and into (b) crackling râles, rattles, or rhonchi.

62. In (*a*) are the *sibilant* and *sonorous râles*. They indicate a condition of the lung whereby the air is not prevented from entering the most minute parts, though it enters with difficulty. They occur in asthma, where there is usually swelling of the mucous membrane of the bronchial tubes, in bronchitis, typhoid fever, &c. They are most evident during an attack of asthma, and in this case they are usually heard all over the chest, and they vary from the sound produced by a violent gale which blows until it whistles, down to the soft cooings of the dove, or the deep tones of the bass-viol. (106, 180.)

63. The sibilant closely resembles the wheezing sound sometimes heard in the nostrils, in cases of inflammation, and of congestion; and as this wheezing frequently runs into a kind of whistle or snore, so the sibilant in the chest joins and alternates with the sonorous.

64. Both of these sounds may, to a certain degree, be imitated by inhaling strongly through the lips, that are partially closed, and at the same time are flexible, in which case a slight, soft hiss is heard. By contracting the lips, and by making them more tense in expiration, a kind of whistle is produced. The former resembles the *sibilant*, the latter, the *sonorous râle*. This experiment perhaps will explain the philosophy of the two

sounds. In slight attacks of bronchitis we hear the sibilant, but in violent attacks of asthma we have the sonorous most manifest. They are very fugitive, being heard one moment and disappearing the next, owing to the removal of the obstruction, mucus perhaps, from the bronchial tube. A single act of coughing may produce or destroy them. They are most permanent in asthma, when they occasionally last several days, and a *sibilant* condition of the respiration sometimes continues for months, owing to a chronic thickening, and congestion of the mucous membrane. (106, 180.)

65. Not unfrequently, a sound like a single whistle or sonorous râle is heard under the clavicle, while in the remainder of the chest there is a healthy vesicular murmur. This indicates strongly the existence of tubercular disease, if the patient be suffering from a chronic affection; especially, if it be connected with any other, distinctly morbid, physical or rational sign. (153.)

66. *Metallic tinkling* is a sound resembling that produced by some wire toys, and can be produced very readily by the following experiment. Into a bladder half full of water, introduce a catheter, and let an assistant blow into it while you have your ear upon the outside, and as the bladder becomes more tense, the sound of the bursting bubbles becomes more metallic, until, at length,

the pure metallic tinkling is produced. On shaking the bladder the same sound is heard. This sound occurs in diseases whenever a bronchial tube communicates with a cavity, having thin and tense walls, either in the pleura, or in the substance of the lung. In pneumothorax it is most perfect, but it is, at times, very distinct over a tuberculous cavity. (164.)

67. *Metallic Echo*, a ringing respiration, without tinkling, and it occurs under similar circumstances.

68. In the second subdivision (*b*), are found the crackling râles, viz., the crepitous, sub-crepitous, mucous and muco-crepitous and gurgling.

69. These produce the sensation as of bursting of bubbles, and there is a regular, gradual, increase in their size and in their other qualities, from the most minute crepitous râle up to the loudest gurgling. Notwithstanding the marked difference between the *crepitous râle* and *gurgling*, the intermediate degrees are often difficult to be distinguished; and *these differences are of no real importance*, because they will be connected with other signs, which will aid the diagnosis.

70. The *crepitous râle* is a sound like that produced, by the crackling of salt, when thrown upon the fire, or by the rubbing of the hair, near the ear, between the finger and thumb. It may also

be artificially produced by pressing a dry sponge upon a thin book or pamphlet previously placed upon your ear. It may be heard by placing your ear upon the lung of some animal, while an assistant inflates it; or, still better, by pressing the ear upon a hair pillow. These last two experiments produce an explosion, as it were, of myriads of very minute bubbles, and apparently of a uniform size, such as we often hear during inspiration. When this sign is heard in the human chest, it commonly indicates either the first stage of pneumonia, or its period of resolution, or œdema of the lung. In two cases of distinct tuberculization, followed by fatal phthisis, this râle was heard for weeks, limited to one spot, where the tubercles were most developed at the autopsy. This is a very rare cause of the sound. (*See pneumonia.*) (120, 155, 195.)

71. The *mucous râle* is a louder, moister, more *irregular* râle, with not nearly so many bubbles as the crepitous.

72. It is heard most often in acute bronchitis, with copious expectoration; and towards the base of the lung. (107.)

73. The *muco-crepitous*, *sub-crepitous*, and *sub-mucous*, are merely intermediate steps to suit the fancy of auscultators, according as the sound approaches more nearly the mucous or crepitous.

These, with the *mucous*, indicate mucus in the bronchi, or cavities. A similar râle is not unfrequently heard in phthisis, at the *upper* part of the lung (156); and in pneumonia (124), and in dilated bronchi (190), usually at the *lower* part.

74. *Gurgling* is the largest and most irregular bubbling, and it indicates a cavity in the lungs. A single bubble is sometimes sufficient to mark it; for it is combined most commonly with cavernous respiration. (42). At times a cough will produce it, when simple respiration fails. By closing the mouth, while we are gargling the throat, we may hear a sound somewhat similar.

75. **EXAMPLES.** A tubercular patient has this under the clavicle, when there is a cavity; and in this case it is the most distinct (158); but it may be heard in cases of gangrene of the lung (171), or of pneumonia, when an abscess is formed, and there is a loss of a part of the substance of the lung, and if the cavity formed communicates with the bronchi. (125.)

76. **N. B.** Irregular cracklings, (*mucous*, *muc-co-crepitous*, or *gurgling*) at the top of either lung, while the rest of the organs are free from any morbid sound, indicate strongly, in a *chronic* case, the existence of phthisis; when at the bottom of the lungs, they mark bronchitis; when heard anywhere, in an *acute* disease, and combined with


a dullness on percussion, or an alteration in the sound of the voice, and in the vesicular respiration, they indicate pneumonia.

77. In the second division we have only one sound, viz., the *rubbing sound* (bruit de frottement). It occurs in consequence of the two layers of the pleura being rough, so that during the respiration the lung, being in motion, produces a rubbing sound. It is usually caused by pleurisy. Any organic change, however, which gives a roughness to the parts, such as emphysema of the lungs, and cancerous and other diseases of the pleura, may cause it. It has various subdivisions, according as it is more or less harsh, viz., the slight rub (bruit de frôlement), and the grating sound (raclement): but there is no difference, except in degree. (128, 135.)

78. EXAMPLES. The simplest form of this occurs from a slight dryness of the membrane, and on the earliest effusion of lymph in pleurisy. (128.) In the later stages, after a copious effusion and a subsequent absorption of a fluid, it is rougher. (141.) It is but rare that it is heard in any other disease.

79. A modification of this sound has lately been noticed, under the name of the *pulmonary crumpling sound*, as pathognomonic of the early stages of phthisis. As the name indicates, it

seems as if one heard, directly under the ear, a sound like the slight crumpling of parchment. I have heard it twice in apparently early stages of tubercular disease. It was connected with no other physical sign, and occurred at the end of inspiration. Both patients had had hæmoptysis; both apparently regained their health.

80.  REMEMBER THIS RULE. *Do not trouble yourself so much about nice distinctions of sound; but observe accurately, first, where the sounds are heard; second, where the focus of them is, supposing that they exist everywhere in both lungs; and third, their combinations with other physical and rational signs.*

81. N. B. A very small sign at the apex of the lung is of much more serious import, than very loud, and extensive râles, in every other part; for the one points to phthisis; the other to bronchitis, dilated bronchi, &c. Remember, therefore, always to compare the signs in the upper part of the lung, with those in the lower; and, in case the râles are very general, if you find only an inch even of the lower part of the lung free, while the rest is affected with râles, you may be sure of having to deal with something more than mere bronchitis. Generally, in this case, you will find the evidences of disease to augment as you approach the apex.

PERCUSSION.



PERCUSSION is more difficult to perform delicately than auscultation. Like the latter, it is either *immediate* or *mediate*.

83. By the former, we mean the striking of the chest with the hand merely, without any intermediate substance. It is now rarely used, because its results are inaccurate, in comparison with those from mediate percussion.

84. Mediate percussion needs a plessimeter. I usually find the fore-finger of my left hand is sufficient for this purpose. The object of a plessimeter is to compress *gently* but *firmly* the soft parts, so as to form a dense vibrating surface over the part of the lung that is examined. After this compression, we strike upon the plessimeter, instead of upon the chest itself, as we do in immediate percussion. Be careful when using your finger as plessimeter, not to put the back of it upon one portion of the chest and the inside of it upon another. Try the experiment upon a table, and you will see the reason for this remark. A wholly different effect is produced in the two cases. The

rules given in (1, 2) must be *more* strictly attended to in percussion than in auscultation.

85. Various plessimeters are used by different practitioners. Among these, the following are

Fig. 21. the most important. *Fig. 21*

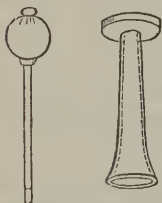


is a simple cubic block of caoutchouc. It should be of a size large enough to be easily held between the thumb and finger,

but to be capable of lying flat in a small space; as, for instance, behind the clavicle.

86. *Fig. 22* shows the stethoscope-plessimeter and percussor used by Professor Bigelow. It is chiefly

Fig. 22.



useful when examining behind the clavicles; because by it we are enabled, better perhaps than with any other plessimeter, to make equal degrees of pressure behind both clavicles, and at like angles. (21.)

87. *Fig. 23* is a piece of very thin smooth ivory. It is Raciborski's instrument. Piorry's

Fig. 23.



is similar, and is usually fastened to his stethoscope. These instruments give a very clear resonance, but the sound has the tone of the

ivory, and therefore is not so pleasant to me as the finger, or the India-rubber.

88. *Fig. 24* is the instrument proposed by Drs. Cammann and Clark. It is a very delicate and



Fig. 24. beautiful apparatus, made chiefly of polished steel. In the plate, *a* is a handle of ivory, riveted to the steel; *b*, a small plate of ivory for the thumb to rest upon; *c*, an oval plate of steel, upon which is fitted a piece of caoutchouc, to prevent any noise from the striking of the finger upon the bare metal. Beautifully constructed as this is, I suspect it will be rarely used; for it is too bulky for every day practice, and moreover is not absolutely necessary, even for auscultatory percussion. (386.)

89. The sounds on percussion of the chest are either *natural*, *augmented*, *diminished*, *changed in note or character*, or *absent*.

90. The *natural* resonance is greatest where there is the least muscular substance covering the chest; hence the axilla, the side, the lower part of the breast and below the scapula, give more resonance than the other parts.

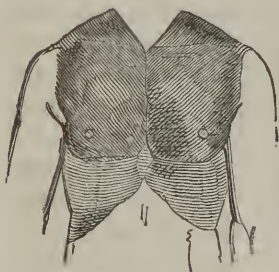
91. These places vary in importance. Some give so little sound — as, for instance, the tops of the shoulders — that they are most unwisely neglected by some auscultators, as giving no definite

results. In all cases of chronic cough I regard them as the most important, for they are the first affected in the earliest stages of phthisis. (143.)

92. The following plates will give, in a *rough* manner, the various shades of differences of sound on percussion of various portions of the chest. I have endeavored to represent the different degrees of sonorousness by the lighter and deeper shadings; the darker points being the more dull on percussion.

93. *Fig. 25* presents a view of the front of the thorax. Above the clavicles, especially towards the top and outside of the shoulders, little sound is obtained. This is a place difficult of percussion, but of infinite importance in suspected phthisis. Below, we find a *difference of note*, between the two breasts, over a somewhat triangular space, from the second or third rib,

Fig. 25.

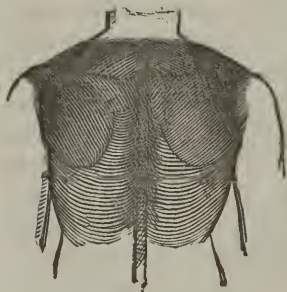


downward to the sixth. This is owing to the heart, the aorta, and the great vessels lying under the sternum, and on a level with the second rib, and thence extending downward. About the fifth rib,

over the cardiac ventricles, is a duller space, and which sometimes is quite flat, for the extent of about two inches in circumference. The outsides of the breast of course are dull, owing to the pectoral muscles. The mammæ, likewise, in women, cause flatness.

94. *Fig. 26* shows that less clear sounds can generally be obtained from the back than from the front. For instance: the tops of the shoulders, the scapulæ, especially towards their exterior edges, and each side of the vertebral column are very dull, almost flat. Below the angles of scapulæ, we get very clear sounds; fully equal, and sometimes superior, to those obtained on the front of the chest. The tops of the shoulders, though the darkest on the diagrams, as being

Fig. 26.



capable of producing but little sound, are however very important when compared together (2, 5). The slightest *difference of note* (99), combined with other physical and rational signs, will perhaps decide your diagnosis. In order to percuss well

in these parts, the scaleni muscles must be compressed very firmly.

96. *Fig. 27* presents profiles of the back and breast, and a front view of the most resonant

Fig. 27.



portion of the chest, viz.: the axilla and the parts below. This part, though the most resonant, is of the least importance; because a disease rarely shows itself there, until it has made very severe and evident ravages, either in front or behind.

96. The sound is *augmented* by strong inhalation, emphysema (177), pneumothorax (166),

&c. by any thing that increases the quantity of air in the chest. Sometimes also I have recognized hepatization of the posterior part of a lung from an extraordinary resonance in front. (123.) I have observed an increase of resonance in some cases of early phthisis.

97. **EXAMPLES.** Pneumothorax gives the loudest sound; next comes emphysema. At times there is great resonance in phthisis, owing, I

think, to the fact, that the vesicles near tubercular deposits are frequently emphysematous.

98. It is *diminished* by any thing that drives out the air. An effusion of fluid in the pleura, (130), pneumonia (122), tubercular (146, &c.), and other organic changes in the lungs; an unusual quantity of fat; a constrained position of the body; or pain on motion of the ribs may produce the same effect. (102.)

99. A *difference of note* between two corresponding parts is not uncommon, when there is no real flatness in either (154). It occurs in cases in which the lung is not by any means impervious to air. Sometimes in the early stages of phthisis (146), of pneumonia (123), in its early or latest stages.

100. There is a peculiar sound produced at times when percussing over a cavity with thin walls, or sometimes, but much more rarely, in hepatization of the upper lobe of the lung. It is called the *cracked-pot sound*, (*bruit de pot fêlé*), and its name explains itself. In itself it is not of great importance. Sometimes, when there is a slight jar about the clavicle, or the percussion is badly performed, a sound similar to this is produced. Hence caution is needed.

101. At times, the sound seems to be as entirely *null* or *absent*, as if the thigh were struck. This

degree of dullness of sound indicates most serious disease. Usually it is owing to an effusion of fluid into the chest; with a greater or less compression of one lung. More rarely, the dullness is as great in very extensive and severe hepatization from pneumonia, gangrene, &c. Malignant and aneurismal tumors may cause a similar degree of dullness, but, in these cases, it is local.

102. EXAMPLES. Fluid in the pleura will, of course, push aside the lung, and cause the greatest degree of dullness; the want of sound from pneumonia is rarely so perfect. Tubercles rarely cause perfect flatness. On the contrary; gangrene of the lungs very commonly does. In fat people, an ivory plessimeter is good to compress the adipose matter, and to bring out a good sound. The position of the body is of vital importance in examining differences of note, in the earlier stages of phthisis; a slight deviation from symmetry in the position of the two sides of the thorax, being fatal to accuracy. Pain sometimes in pleurisy prevents the ingress of air, hence arises a difference of note between the affected side and the other.

Percussion is of great importance in all pericardiac and cardiac diseases. (248.)



PHYSICAL SIGNS OF LARYNGEAL DISEASES.

BARTH and Roger mention, 1st, the "harsh laryngeal respiration," 2d, the "sibilant," 3d, the "sonorous," 4th, the "cavernous and gurgling," and 5th, the "flapping râles;" as indicative of laryngeal affections.

The 1st attends acute and chronic laryngitis; tumors compressing the trachea; croup.

2d. Spasms or œdema of the glottis; stridulous laryngitis; foreign bodies in the trachea; compression of the trachea.

3d. Laryngeal ulceration, and vegetations; croup.

4th. Hæmoptysis; laryngeal ulcerations; foreign bodies in the trachea; death-rattle.

5th. Membranous croup.


I have rarely used auscultation in these affections. It *may*, however, aid you in their diagnosis; but I have usually found the rational and other local signs much more important.



PHYSICAL SIGNS OF BRONCHITIS.



s there are two kinds of bronchitis, viz , *acute* and *chronic*, so their physical signs are different.

105.  In certain cases, of both kinds, you may get no physical signs.

105. EXAMPLE. Let an individual be affected in the larger bronchial tubes, and have but little expectoration. In such a case, there is nothing to produce physical signs, because there is nothing which seriously obstructs the passage of the air in its circulation through the bronchi. This absence of signs is very common in chronic cases.

SIGNS OF ACUTE BRONCHITIS.

106. In the earliest period of the disease, a sonorous, or sibilant râle, (62,) or both combined, are heard in various parts of the chest ; chiefly, however, at the middle and lower parts of the back. If they be found all over the chest, they are, usually, more distinct at the lower than at the upper part. They are owing chiefly to a thickening of the mucous membrane of the air tubes.

107. As the disease augments, and expectoration begins, the crackling râles commence, and


these likewise are usually, heard most distinctly at the bottom of the lung. There may be *mucous* (71), *submucous*, *muco-crepitous*, or *sub-crepitous* (73). All these may be mingled with the sonorous and sibilant; but, usually, in this stage of the affection, the sonorous and sibilant are less constant than in the previous stage, owing to their being caused more by obstruction, from the mucous secretions remaining in the air-tubes, than from a thickening of the mucous membrane of the bronchi.

108. As the disease subsides, and the expectoration diminishes, because the mucous secretion is less, these various râles all diminish, and are heard last in the lower parts of the lungs.

109. Finally, nothing manifestly abnormal is observed, except a few crackling râles, during an access of coughing either in the morning or evening; but during the remainder of the day, nothing is perceptible, except a slight waviness and a little less expansiveness than usual in the respiration (45).

110. Especially is this waviness manifest after coughing. I have met it a few times. I call it *mucous respiration*, in contradistinction to *mucous râle*. It seems as if there were a little moisture in the minute bronchi, and only a little more were needed to produce *pure* mucous râle. This

increase of secretion actually occurs, with the production of *mucous râles*, about the time of the usual fit of coughing ; but at other portions of the day the membrane is drier, and the *mucous respiration* alone is heard.

111. N. B.  Hence the importance of examining such doubtful cases during the period of the usual access of cough, whether that period occurs early in the morning before rising in bed, or late at night.

112. EXAMPLE. A. B. called at the Infirmary for the Diseases of the Lungs. He had chronic cough, which he suspected to be “consumptive” in its tendencies. I found no physical signs to confirm this view ; but, instead, I heard *mucous respiration* at the bottom of both backs. I learned that he had, usually, his most severe periods of coughing early in the morning. Accordingly, I delayed my diagnosis. Visiting him at six the next morning, I found him in bed, according to appointment, having made no effort, and having had no cough. The exertion needed in the examination produced a cough, and distinct *mucous râles* were heard at the bottom of both backs, or, in other words, at the precise spots where *mucous respiration* was heard at noon of the preceding day. Thus I was confirmed in two views, viz. . 1st, that *mucous* respiration indicated a smaller de-

gree of secretion from the bronchi than that necessary to the production of râles; and 2d, that the case was one of bronchitis and not phthisis. (116, 143.)

113. The respiratory murmur, except in being sometimes obscured by the râles, or temporarily lost owing to mucus in the tubes, the resonance of the voice, and the results of percussion, are natural in acute bronchitis.

SIGNS OF CHRONIC BRONCHITIS.

114. They may be wholly absent where there is no mucous secretion. The sonorous râle (62) is rarely heard, and is never so constant as in the acute form. A mucous râle (71) heard occasionally in various parts of the chest, but chiefly at the base, is the most striking phenomenon. The *place* in which this râle appears will generally enable you to distinguish bronchitis from phthisis. (81, 143.)


115. The respiratory murmur may be a little roughened or obscured, as in acute bronchitis. (113.) The resonance of the voice, and the results of percussion, are normal in chronic bronchitis.

116. EXAMPLES. A man is seized with febrile symptoms; and perhaps will have some wheezing in the nostrils, which, in one or two days, may extend to the lungs. At this period, the sibilant and sonorous râles are heard; indicating conges-

tion and thickening of the mucous membrane. This stage lasts, usually, less than a week, and, gradually, runs into that in which the crackling râles will appear. These are owing to a secretion from the bronchial mucous membrane; and with it comes, usually, some relief to the active congestion. They may last indefinitely. In a severe case, they rarely wholly disappear before the lapse of three or four weeks; and, in some feeble persons, they continue as many months. They are heard at the *bottom of the lungs*; or they alternate with the wavy mucous respiration, described above (112). Finally; all the râles may disappear, yet the cough may remain; owing to a thickening and an irritation of the membrane in the larger bronchi.

During all these periods, there is no *serious change* in the respiratory murmur. It may be obscured, or it may be wholly absent for a time, owing to a portion of mucus obstructing a tube, but a full breath, or a cough, will reproduce it. There is no change in the sounds of the voice, or in the results of percussion; and if, perchance, in a case of *suspected* bronchitis, you perceive any modification of either, you may be sure that you are wrong in your diagnosis, and that you are dealing with some disease much more serious, it may be; probably either with pneumonia (122), pleurisy (135), or phthisis (153, 154.)

PHYSICAL SIGNS OF PNEUMONIA.

 HIS disease may occur in any part of the lung, and you must examine more carefully than in bronchitis. Most frequently, however, it commences in the lower lobe (*fig. 18*), and thence extends, involving the whole of that lobe, or the greater part of 9, 6, and 5, and perhaps 4 ; sometimes the whole lung.

118. The *first* signs are, either a diminution (28), or an increase (28), of the natural respiratory murmur. I have seen a case of the former ; with a case of the latter I have not met. Sometimes there is a *rudeness* or roughness of the respiration (43). Ordinarily, however, these abnormal sounds are rarely observed, because this stage lasts but a few hours, unless the inflammation begins in the centre of the organ, and thence extends to the surface of the lung. In this case the diminution may last for some days. At times, we hear an increased respiratory murmur around an inflamed part, in which a crepitous r  le and a bronchial respiration are the most prominent signs of inflammation. In such a case, the *probability* is, that you will hear crepitation in that part, within twenty-four hours.


119. **EXAMPLE.** I have had a case, in which there were marks of severe febrile action in the system, and pain in the right side of the thorax ; but no physical signs, except an obscurity in the respiration about the right scapular region ; until, after the lapse of three or four days, a fine crepitous râle came up, apparently from the deep seated parts, to the surface of the lung ; and a plain case of pneumonia then became evident. In this case, I presume that there was some internal pneumonia which extended outward.

120. The *second* sign, and what is usually first heard by the physician, is a crackling in the inflamed portion. This may be coarse, but usually it is a very minute *crepitation* (70). When you hear this last, you may be sure that the first stage of pneumonia, or congestion of the lung, has commenced. The voice may be slightly altered, and the percussion may give a change of note ; but they may be both entirely normal. (99.)

121. ☞ Sometimes, the crepitus is heard only at the first inspiration, after the patient rises for examination ; at others, a cough, or a long inspiration, or both combined, will alone produce it. When pure and most distinct, it resembles an explosion of myriads of very minute, regular, and dry bubbles, and is heard during inspiration. (70.)

122. The *third* sign, and marking, what is


usually called, the second stage of pneumonia, or red hepatization, is bronchial respiration (41). With this you will have bronchophony (51), and dullness on percussion (98).

123.  The type of morbid bronchial respiration, (39, 40, 41) may be heard in this stage of pneumonia. Sometimes, however, it is scarcely heard, except during the act of speaking; and hardly at all, during that of respiration. The bronchophony (48, 51), likewise varies; being sometimes a slight modification of the voice; while, at others, it is almost like pectoriloquy (47, 52). The dullness on percussion is very rarely so great, as that found in pleurisy. (101.) Hence, merely a *change of note* (99) is of consequence in the diagnosis of pneumonia. Twice I have observed a very curious phenomenon in this stage of pneumonia, of the posterior portions of a lung; viz.: an almost tympanitic state of the breast. (96.)

124. If the patient begins to recover, you will hear a crackling ("*returning crepitous râle*," 70,) as the lung becomes softer, and the air again enters the minute cells. This is, at first, minute; but in a few days it becomes larger (sub-crepitous, 73). The voice becomes more natural. But the results of percussion are, at times, apparently unfavorable, for the dullness augments as the other

signs improve. I presume this is owing to an œdema of the lung, similar to that which comes on after an external inflammation; whereby the parts become more swollen than they were during the acute stage.

125. But if the lung suppurates, you will hear a large, irregular crackling and gurgling. The pure bronchial respiration, and the bronchophony, disappear; and instead of these, you will hear a rude, indistinctly tubal, sound (43), and a less clear resonance of the voice; unless, indeed, a cavity forms; in which case, you will probably hear gurgling (74), an obscure cavernous respiration (42), and perhaps pectoriloquy (52).

126.  The description given above, strictly speaking, applies only to adults; for, although the same phenomena *may* occur in children, still, in these latter persons, the rôle is, *usually*, less fine, and is heard, more generally, over the lung; and the bronchial respiration, and bronchophony, *may* be wholly absent. It is rare, moreover, that the results of percussion are so manifest in children as in adults. If, in a child affected with a great febrile excitement, owing to a severe pulmonary trouble, I find râles to exist everywhere in the lungs; especially, if they are minute, I *fear* that the case will prove serious; probably pneumonia. If, with these circumstances, a dullness

of sound is heard on percussion ; particularly if one side is duller than the other ; I feel *certain* that pneumonia exists. (2, 3.)

127. EXAMPLE. A man is seized with cough, rusty, viscid sputa, fever, &c. ; and if you are called within forty-eight hours, you will, in the majority of cases, hear a crepitation, with a change in the tone of the voice (56, 57), and a difference of note (99) on percussion ; or, in other words, signs of a partial hepatization of a portion of one of the lungs. The disease augments ; and the crepitous râle disappears, in part, at least, usually in twelve or twenty-four hours, leaving a pure bronchial respiration (41), and bronchophony. The percussion, which previously has not given very marked results, probably nothing but a modification of note, now gives a dull sound. (98.) This stage continues longer than the first, usually from three or four days to a week ; but towards the latter part of this time, a returning crepitous râle (70) begins to be heard on coughing, or on any active effort to inspire deeply. From the end of the fifth to the tenth or twelfth day, the bronchial respiration begins to diminish, and becomes daily less and less clear ; the crackling becomes louder and more irregular. The dull sound on percussion, on the contrary, often continues to augment. Finally ; by the sixteenth

or seventeenth day, the bronchial respiration will have wholly disappeared ; but the râles may remain, in a slight degree, with some dullness, for weeks after full convalescence.



PHYSICAL SIGNS OF PLEURISY.

IF you are fortunate, you may hear, as the earliest sign, a diminished respiration on the affected side, owing to the unwillingness of the patient to expand the chest. The pain prevents him from doing so. But, generally, the first sound heard is a *rubbing sound*, (77), owing to the dryness of the pleura ; and it will be most manifest where the lung moves most, either in 4, 6 or 10, (*figs.* 17 and 18).

129. EXPLANATION. With each act of respiration, the two pleuræ, lubricated as they are in health, move noiselessly up and down one upon the other. In pleurisy, they become dry, or have a thin deposite of lymph on each surface ; and, of course, some sound is produced when they are rubbed together.

130. Among the first symptoms is dullness on percussion (101) in 10, owing to a fluid effused, and the gravitation of it toward the lower part of the chest. You may mark the height of the liquid by the dullness, and no disease of the chest so destroys all sound as a pleuritic effusion. Of course, the extent of the flatness increases with the quantity of fluid, and, as it sometimes is so great as to fill the whole of one pleura, you will perceive absence of sound throughout. (28.) In this case, the lung is wholly compressed against the spine.

131. When in doubt about the dullness, as you may be, where a small quantity of fluid is effused, change the posture of your patient and see if the most depending portions of the chest become flat, while the same parts are resonant when uppermost. Nothing but a pleuritic effusion can produce this effect. I have met with one or two rare cases in which a change of posture produced no difference; in consequence, I presume, of old adhesions preventing any motion of the fluid.

132. As an effusion of fluid causes, as we have seen (130), a partial or total compression of the lung, the respiratory murmur is diminished, or it may be entirely absent; and in this case we find a puerile or increased murmur in the healthy parts (25, 28), and throughout the other lung.

133. Some speak of a hægophonic respiratory murmur. It seems to be a mingling of the bronchial and the vesicular, or it is an indistinct bronchial respiratory murmur. (80.)

134. At times, however, a distinct bronchial respiration (41) is heard, even when there is a pleuritic effusion; but this is rare. I have met with two cases, in which that sound was as distinctly bronchial as I ever heard it in pneumonia. Nevertheless, the differential diagnosis between pneumonia and pleurisy is usually not difficult; inasmuch as, in pleurisy, there are usually none of the râles of pneumonia, and the dullness on percussion is greater in pleurisy than in pneumonia.

135. The voice is always *modified* (55): at times it is simply diminished, when the effusion is very small or very great. When a thin layer only is between the lung and the outside of the chest, we get *hægophony*. (54.) Hægophony is favorable after extensive effusion, because it marks a diminution of the fluid, and if it be followed by the rubbing sound (77), your patient is *usually* cured.

136. ☞ This is the old statement by Laennec, and it is followed generally by writers; but, of late, not a few have found that hægophony may exist when there is a great effusion. I have

heard it, in one case, in which the chest was found so full of fluid that the lung was almost wholly compressed.

137. When there is an effusion to a great amount, there is an *enlargement* of the diseased side, and when the patient is cured there remains permanently a *contraction* of the same, drawing down the shoulder, and causing an apparent projection of the lower angle of the scapula. (16, 17.)

138. N. B. In some cases, I have known this falling back of the scapula to be a serious annoyance to the patient; by causing the arm of that side to swing towards the spine, rather than in a plane parallel to the side of the body; whereby a difficulty in walking was produced (142.)

139. *Immobility* of the thorax is consequent upon a large effusion, and the slight thrill to the hand placed upon a healthy chest is destroyed by the same. Neither of these signs, however, are of much importance when compared with others. (10, 14.)

140. When the effusion is great, all the adjacent organs are liable to displacement. The heart may be pushed wholly to the right side, the liver may be thrust down below the cartilages of the ribs, &c. So, likewise, when contraction ensues, after absorption of the fluid, these same organs may be drawn out of their places.

141. EXAMPLE. *First.* A man may have no *rational* signs, and then the physical signs detailed above become of vital importance. The disease is, in fact, wholly *latent* without them. Usually; after some fever and pain in the side, with a slight and difficult cough, without expectoration; we find, within the first two days either a *rubbing sound*, (77) from the layers of inflamed pleura, or a diminished respiratory murmur, owing (28) to the pain in the side preventing the full expansion of the lung. *Second.* The disease goes on; and, within a week, a *dullness*, (101) of a most marked character, but over a small extent, is observed in the lower two or three inches of either back. With this comes a still greater diminution of the respiratory murmur in the same parts; although owing to the subsidence of the acute pain in the side, it may have augmented generally in the lung. A slight *modification of the voice* (55) frequently appears at this period. Change of posture will begin to be of use. Let the patient lean backward from the side of a chair; let an assistant support his shoulders, while you strike on the back. Keeping your finger upon the highest point in the back that becomes dull in this posture, let the patient stand up and lean over so that the trunk shall be again horizontal, but the breasts, being the most depending parts, will be

flat, while the back, previously flat, will emit a clear sound. In this manner, a very small quantity of fluid will be discovered. *Third.* The effusion augments, hægophony (54) appears; and perhaps half the chest is filled with fluid; the flatness rises higher; the respiration becomes null (28) or is but very slight in the same parts. The sides begin to be enlarged (8); the intercostal spaces to swell out. *Fourth.* The greatest degree of effusion may occur, and the whole lung become compressed; the parietes then are immovable, (10), enlarged, perfectly flat even up underneath the clavicle and on the top of the shoulder (130); the respiration is null (28); and hægophony (54) usually disappears. At this period the organs, liver, heart, &c., are displaced as described (140). This state of things, under bad circumstances, may occur within a fortnight from the attack; and it may last for months; and, finally, as happens in a few cases, it may point and discharge externally, or the patient die from exhaustion, unless the chest be tapped, and the fluid removed. *Fifth.* The absorption may commence; and the dullness on percussion diminishes from above downward; the respiration returns at the top and thence proceeds towards the base; the hægophony soon reappears (54) at the lower edge of the pectoral muscle or scapulæ; the ribs begin to move, and to contract,


and the coarse rubbing sound begins (77). *Sixth.* The absorption is complete ; the respiration, however, remains for months, if not for years, diminished throughout the whole lung ; the rubbing sound may remain for sometime, and be perceptible to the patient a long while after it has become imperceptible to the auscultator. The side contracts, the scapula and arm fall toward the vertebræ, and the shoulder is depressed. (138, 142.)

Fig. 28.



142. The accompanying *Fig. 28* shows the appearance of a patient after recovery from severe pleurisy of the right side. The right shoulder and elbow are lower than the left ; and the whole of that side of the chest is contracted. This causes the scapula to fall backward, toward the vertebræ, and downward ; so that its angle is lower than that of the left. It is likewise farther toward the vertebræ, so that the arm, in walking, moves with less ease than usual (138.)

PHYSICAL SIGNS OF PHTHISIS.

 SINCE tubercles are developed in adults at the apex of the lung (*Fig. 17*, Div. 1,); and at the upper parts of Divisions 2, 7, 8, (*Fig. 17*, 18,); we must look in these places, and not in the lower parts, 10, for the first signs of phthisis (37, 117.)

144. As pleuritic adhesions are not uncommon over a spot of the lung containing tubercles, we usually find a contraction of the soft parts behind and below the clavicles; causing thereby an apparent prominence of the clavicles (9.)

145. Hence; if, on *inspection*, we perceive a depression about one clavicle, that is not seen about the other, we have an indication of some importance (9).

N. B. To judge fairly on this point, the patient should be standing perfectly erect, (1 and *Fig. 1*).

146. *Dullness* on percussion (93) in the post-clavicular space, or at the tops of the shoulder, is another very important sign. It may be in one of the former, or in one of the latter places; sometimes it is observed in both. Should it be in *either*, if the *rational* signs of phthisis exist, we may be


justly led to suspect a small deposit of tubercles. Generally the same remark holds good with reference to a simple *difference of note*. (99) If connected with *any* change in the respiratory murmur, or resonance of the voice, this change of resonance becomes of still greater importance.

147. As the number of tubercles increases, the diminution of the sound on percussion extends lower; and may, at last, occupy the whole of one lobe, which perhaps becomes distinctly flat.

148. In certain cases, there is an *augmentation* of the natural sounds on percussion (96); even when there are many tubercles. This may occur where there are merely crude tubercles; and it is owing then, I am disposed to think, to the fact, that the vesicles around these tubercles are very much dilated; a fact which is not of uncommon occurrence. The same may occur when there is a softening of the tubercles, and consequently an admission of more air; and, finally, it may become very manifest over a large cavity; and co-exist with that sound, named the *cracked-pot sound*, (*bruit de pot fêlé*, Fr.) (100).

149. The *respiratory murmur* alters. The earliest sound, but what is of rare occurrence, is the pulmonary crumpling sound (79). It indicates the deposit of a very small number of tubercles. A few more tubercles may almost wholly obscure

the sound of inspiration and expiration (46); it may make the inspiration jerking so that the air seems to force itself into the structure of the organ, by jerks, (45,) as if it had to overcome obstacles before it could enter; at times, too, the expiration is prolonged, while the inspiration is much shorter than usual (36).

150.  Hence either of these alterations, or, in fact, any difference between the *sounds* of the respiration, as heard in the two apices, becomes a very significant sign (80). A natural exception to this has been mentioned in (38).

151. As the tubercles augment in number and size, the differences above-mentioned increase, and we may get a *rude* respiration, (43,) indicating a partial solidification of the lung, but not enough to produce pure bronchial, (41), or to destroy wholly the vesicular murmur (24.)

152. In this stage, the voice, which previously has not been altered materially, may become more resonant. I have seen cases where it was diminished in resonance (56); and I consider this as important a sign as the increase of it; for it indicates a want of homogeneousness in the lung, owing to the fact that groups of tubercles are intermixed with the healthy lung.

153. When the lung is in this condition, if you cause the patient to cough, you will hear, at times,

a single click or a single sonorous râle or whistle of the most delicate and distant character. Either of these sounds, heard ever so slightly, just below the clavicle, or at the top of the shoulder, (while in the remainder of the lung is heard healthy respiratory murmur), may be considered as a very unfavorable sign (65). If combined with any change in the inspiration or expiration, they become still more momentous (*Fig. 20, No. 2.*)

154. If with the above signs there be a change on percussion; especially, if united with, the most trivial, rational symptoms of phthisis, you may be almost morally certain that tubercles have been developed.

155. In two cases of undoubted phthisis, and in neither of whom was there copious hæmoptysis; I heard, for many weeks in succession, a very fine crepitus (70). When I first heard it I supposed the case was one of acute pneumonia, and used remedies for that disease; but the râle continued unchanged for weeks, and, finally, a tubercular cavity was formed. I have no doubt, therefore, that a tubercular deposit may, at times, cause as minute and as copious an explosion of crepitation as the acutest pneumonia. Dr. Fisher informs me that he observed the same phenomenon, while auscultating a patient, who immediately began to have hæmoptysis.

156. When one or several tubercles soften and open into the bronchi, you will hear, more or less distinctly, a crackling, mucous or sub-mucous râle (71, 73); generally most clearly during inspiration, or, still better, after coughing and along with respiration. This, in a chronic disease, attended with cough, (*figs.* 17, 18,) and entirely confined to either Nos. 1, 2, 7 or 8, is almost pathognomonic of phthisis. Connected with crackling you may get changes in the respiratory murmur. It generally is somewhat *tubal* or *bronchial* but never as distinctly so as in hepatization from pneumonia, (39, 41). The percussion likewise gives more decided alterations from the normal sound.

157. As the disease still advances and cavities form, you will hear gurgling, (74,) produced either by common inspiration or coughing.

158. The voice, in the earlier stages, rarely alters so much as in pneumonia, because portions of healthy lung are mixed with the tubercles, and consequently the sound is not transmitted so readily. When cavities form you will have pectoriloquy (53) divided into several kinds, according as the voice seems to resound more or less. It is, of course, more evident after expectoration than when the cavity is full of fluid. In fact, you will frequently hear gurgling before expectoration, but afterwards cavernous or amphoric respiration, pectoriloquy and the cracked-pot sound (74, 42, 52, 100.)

159. The cough is quite resonant as the voice is, and it frequently produces signs, crackling, &c., when simple respiration will not ; hence it becomes important as a sign in itself and as a cause of others (112, 121, 153, 156.)

160. Mensuration and Palpation, though noticed by some writers, seem to be of little importance in comparison with others much more striking (See Mensuration and Palpation.) (16, 10.)

161. Sometimes the sounds of the heart will help you, for, as they are transmitted more readily by a solidified part than by a soft yielding lung, you may infer that a part is more solid than usual by the greater transmission of sound. For example ; these sounds are usually heard better under the left clavicle than under the right. If the reverse takes place we may suspect disease of the right.

162. Example of chronic phthisis. As it is impossible to give any definite period, at which the peculiar signs occur ; I will briefly give you an idea of my method of examining any case of chronic cough, in which I *suspect* phthisis. In the first place, I spend from twenty minutes to half an hour in learning the exact condition of the patient ; his previous health from early age ; his hereditary tendencies ; the various diseases he has been subject to during his life ; his profession and

the influences of that upon his health. Having learned these and considered their bearing as predisposing causes of phthisis, I endeavor to fix the exact commencement of his actual disease, and to discover whether it showed itself, first by symptoms in the chest or elsewhere. After fixing those dates, I trace the different phases of the disease and general state of all the functions up to the moment of examination. Finally ; I examine the cerebral, thoracic and abdominal functions in their actual condition. In doing all this, I may date back the commencement of the actual disease for weeks, months, or even years. I proceed then to the physical signs. In order that we may be more definite in our views, let us suppose that a man has had cough for some months ; that he has or has not had hæmoptysis ; that he has or has not had trouble in his digestive functions. Let us suppose that he has emaciated somewhat ; has lost strength, but is still able to attend to his work. Let us imagine, moreover, that occasionally he has had slight "rheumatic pains," as they are called, about either of his sides or shoulders. In a word ; let a man be affected with *any* rational symptoms that could be referred to tubercular disease of the lungs. I then strip the chest wholly bare, and make the patient sit or stand very erect with the hands hanging by the side (*fig. 1*). If the clavicles are

prominent; if the intercostal spaces are contracted; if the chest is flattened in front, I *fear* phthisis, (9). If I see one clavicle much more prominent than the other, I fear still more that, in the apex corresponding to the most prominent clavicle, (9,) I shall find tubercles; more especially, do I anticipate this result, if the “rheumatic pains,” mentioned above, have generally been seated in that part. In regard to the movements, constrained or otherwise, of the parietes of the upper part of the chest, I pay but little attention though they may at times be of service, (10). I observe whether one shoulder is higher than the other; whether the ribs have fallen in behind, causing the scapula to fall towards the vertebra, and whether the nipple is depressed, all of which are the signs of old general pleurisy, (9, 138). Having inspected sufficiently, I proceed to percussion. I examine, with especial care, the clavicles, in order to discover the slightest difference of sound between corresponding parts of each clavicle, (4). Any degree of dullness, even the slightest *difference of note* (99), *if confined to the upper part* of the chest, between two portions equidistant from the spine or sternum augments my *suspicion* of the existence of tubercles. I care not whether that dullness be found on a part of the clavicle, or a spot only an inch square, at the top of the shoul-

der, over the scaleni muscles ; if there be a decided difference, on repeated trials, my faith is, as mentioned. If there is great dullness, for two or three inches from the top, while elsewhere percussion gives a clear sound, I am almost sure there is tubercular disease. If, on the contrary, the dullness extends all over one lung, I am doubtful if it be not the result of former pleurisy. If the dullness is at the base of the lungs, and the upper part is clear, I am morally certain that the disease is not tuberculous ; i. e. if the patient is an adult. If it be a child, there is some doubt, because tuberculous disease sometimes attacks the lower part of the lungs in youth, while the upper portions are healthy. Having noted *thoroughly* all these results of percussion, even in their minutest shades, I proceed to the auscultation of the respiratory murmur. My object is to examine the inspiration and expiration, to observe whether their ratio is normal (36) ; whether one is shorter or longer than it ought to be (46) ; whether the inspiration is full and expansive, corresponding in duration to the movements of the chest, or whether it is shortened, so that the parietes are felt to rise and to expand considerably under the ear before the vesicular sound is heard ; whether there be any prolongation of the expiration (38) ; whether either of these acts are jerking (45,) as from some

obstruction to the passage of air ; whether there is the slightest râle, of any kind, with either ; and, if there be, whether it is limited to the upper parts of the chest. If either of these conditions occur, and the results of auscultation and percussion agree, even in the slightest degree, my *suspensions* are *confirmed*. For example ; let us take the most simple case. Suppose I find a difference of note ; the right lung, at its apex, resounding less well than the left ; if, in the same spot, I find the inspiration shortened, in a case where the rational signs point to phthisis, I feel certain of the existence of tubercles. If, however, the rational signs do not indicate the existence of phthisis, I shall have doubts about the diagnosis ; but I shall have, nevertheless, very great fears that there are a few tubercles deposited near the part. But, suppose I find absolute dullness and evident crackling ; then I am sure of tubercles being there in a softened state ; the forerunners of a cavity with gurgling and pectoriloquy.

In these examinations, I auscult during the common measured breathing which the patient is accustomed to. Having thus examined the whole chest, I try the effect of long breaths, at stated intervals, upon all parts that I have previously examined. Thus, I frequently am able to find some of the differences in the murmur, or some of the râles,

mentioned above, when nothing marked can be discovered in common breathing. In making the patient do this I am careful that the sound from the mouth, simulating bronchial respiration, is not transmitted. Many gross errors arise from neglect on this point. Having tried long inspirations, I make the patient cough and immediately inhale deeply, and listen to that and the râles which it sometimes produces (159). Through these remarks I have supposed that I am examining a doubtful early case of phthisis. But the rational signs may be very manifest; hæmoptysis, hectic fever, emaciation, &c., being present. I may then obtain greater differences on percussion; or if there is not any manifest difference on percussion, owing to the equal development of the disease in both lungs, I may still decide unfavorably for my patient, for, very likely, the respiration may have become *rude*, or coarse, (43,) which indicates there is under the ear, much more of tubercular disease than of healthy lung. In others I may find that the lung is greatly solidified, causing an absence or great diminution of the respiratory murmur (28); or, possibly, a distinct bronchial or tubal sound may be heard, indicating a small cavity, with possibly condensation about it (41). Finally, I may find a cavernous sound, (42), which becomes to me an indication of a large excavation

with thin parietes. Connected with these variations in the murmur, are the râles I frequently hear. For example. A slight sibilant or sonorous râle, or a single click (65) is often heard in the *rude* respiration (43); and it is then indicative of condensation without excavation; a crackling (73) with the simple tubal (39 to 41), indicating softened tubercles, and finally gurgling (74) with the tracheal or cavernous, (42), indicating large ulceration. I remember that frequently these râles are produced only by a full breath, or a cough. Hence I cause the patient to cough, and generally perceive the importance of the act, as I have already stated elsewhere. In addition to the production of râles the cough is useful in itself as a means of testing the resonance; I therefore notice the amount of that *resonance* in the same manner as I notice the resonance of the voice.

If, in *any* phthisical case, I find marked resonance of the voice or any manifest difference between the two apices, except, perhaps, a little more resonance at the top of the right than of the left (38, *fig.* 19) my prognosis is very unfavorable, for a very general condensation by tubercles is indicated, or what is more common, a cavity, either larger or smaller, in the portion of the lung under the ear. (57.)

ACUTE PHTHISIS, AND PHTHISIS IN CHILDREN.

162 a. The physical signs of these diseases are very inferior to the rational signs. In fact, the former has none that can be called peculiar, or, in the least, characteristic of the disease. (12.) Phthisis in children rarely presents the same manifest and regularly ordered signs as are found in adults; and for the diagnosis we must depend chiefly on the rational signs.

PHYSICAL SIGNS OF PNEUMOTHORAX.



NEUMOTHORAX causes a sudden enlargement, immobility, either partial or general, and a permanent distention of the walls of that side of the chest which is diseased.

164. There is absence or a very great feebleness of the respiratory murmur, or, perhaps, if there is a free communication with the bronchial tubes, there is amphoric (44) respiration; a metallic echo (67), or tinkling (36), if a little fluid be mingled with the air, and it is produced either by inspiration, or by shaking the patient, or by the act of swallowing.

165. The voice, usually, is not much modified ; but sometimes, when there is a very clear amphoric respiration, you will hear an increased resonance ; and, in this case, usually, there is a diminution of the vibration of the parietes of the chest (37, 14.)

166. Finally, there is great resonance on percussion, tympanitis of the diseased side, especially in the earliest period of the disease. N. B. This great resonance usually *does* occur. Nevertheless I have met with cases in which, had I depended entirely on the resonance, or, in fact, upon any of the physical signs, I might have been deceived.

167. The surrounding organs, the liver, heart, spleen, stomach, &c., are pressed out of place by the quantity of air distending the pleura.

168. EXAMPLE. The most common cause of pneumothorax is a rupture of a portion of the lung into the pleura, from the bursting of a tubercle, or of a small gangrenous eschar on the surface of the lung. In either case the pleura becomes filled with air. Great orthopnœa, cold sweats, almost total loss of voice, usually severe pain in the side, great prostration, and lividity of lips ; all the signs, in fact, proving that a large portion of a lung has been suddenly prevented from the performance of its functions ; these

symptoms, suddenly appearing, are, of themselves, almost sufficient grounds of diagnosis. The permanent distention (10), the augmentation of the resonance (96) on percussion, are always present; the metallic tinkling (66) is most usually heard; amphoric respiration (44) rarely, unless a large aperture communicates between the bronchi and pleura. Phthisis most frequently produces this; but gangrene of the lung has done it. The other causes of pneumothorax are of a more chronic nature, and have similar though less severe symptoms.

PHYSICAL SIGNS OF GANGRENE OF THE LUNG.

BEFORE the disease reaches the surface of the lung, and the physical signs appear, you may suspect its existence from the fœtid sputa; but if the disease is extensive, and reach the surface of the lung, you will have, in the earlier stages, a total flatness (101); and if deep seated, and healthy lung above it, you may obtain merely a slight difference in tone (99) between the diseased and healthy parts. When a cavity

forms, you may, if it be superficial, get the cracked-pot sound. (100.)

170. The respiratory murmur is lessened, or roughened, and as a cavity forms, you will obtain cavernous respiration (42), which, however, is apt to appear distant, and sometimes is heard only during the act of coughing.

171. There are various irregular crackling râles heard during the disease (68). As soon as the parts begin to soften the common mucous (71); when a cavity appears, gurgling (74) is heard with the cavernous respiration (42.)

172. The voice is altered. Its resonance is either augmented (57) or diminished (56) before the abscess forms; it becomes pectoriloquial (52) afterwards; which gradually subsides after months of convalescence.

173. N. B. The physical signs are not nearly so diagnostic as the rational.

174. EXAMPLE. A man is seized with cough, and if there is any expectoration, it is not peculiar until after a time varying from a week to several months. It then becomes somewhat offensive to the smell, very nauseous to the taste. This augments and the expectoration becomes dark, more fluid and very offensive, so that sometimes the apartment and it may be a whole house is scented with it. This state of things may come on suddenly

from a sudden communication of the gangrenous mass with the bronchi, or be slowly superinduced, but the gangrenous odour is the only certain sign of gangrene. Usually in such a case you will get marked dullness on percussion, (101), crackling, gurgling, (68), cavernous respiration and great resonance of the voice, (42, 52). As the patient recovers, the râles diminish, and finally are heard only on coughing, or deep breathing; the resonance of the voice subsides; the respiratory murmur gradually comes again, but very slowly, and frequently by a full breath a deep seated cavernous sound, or râle is brought out in a spot where on quiet breath the respiration seems only slightly less than it is in the other lung. A year or eighteen months is a moderate time for a person to recover in, after having had a large portion of the lung slough, such as occurs not unfrequently in cases of gangrene. Sometimes, cases of gangrene have been mistaken for phthisis. Of course, the *spot* in which the diseased sounds are heard, may possibly assist you in your diagnosis, for if you find the chief signs towards the middle or base of the lung, you will be almost sure that it is not a case of phthisis (143). Should the signs occur at the top the diagnosis will be more difficult and the rational signs would have to be depended on. In one case that I saw, the percussion, giving a very flat sound, made us *suspect* gangrene.

PHYSICAL SIGNS OF EMPHYSEMA OF LUNG.



MANIFEST *enlargement* in the intercostal spaces. As phthisis causes depression behind the clavicles, so emphysema produces a fullness in the same part (8, 144).

176. The parietes of the chest move with much effort, as if from permanent distention, during the respiratory act (10).

177. On *percussion* there is an extraordinary resonance of the chest (97).

178. The respiratory murmur is usually diminished very much; at times it is wholly wanting (28). At times the expiration is much longer than natural and it becomes, as it were, a constant, slight, sibilant râle.

179. The resonance of the voice is as in health, or is diminished (56).

180. The sibilant râle is frequent (62), and sometimes is mistaken for the respiratory murmur, and during a severe attack of asthma (which this disease gives rise to) you will have all the sounds above described, viz. : sonorous, mucous, sub-cre-

pitous, &c. (62, 72, 73). They are usually heard in all parts of the chest.

181. The sounds of the heart are transmitted less clearly.

182. EXAMPLE. This disease, in its severity, is found almost exclusively among old asthmatics. In fact, emphysema and asthma according to some writers, are cause and effect. The patient rarely shows any physical signs of importance, except during an acute attack of bronchitis, to which emphysematous people are peculiarly liable. Soon after such an attack you will find him wheezing, and with a dry cough, and difficult expectoration. On inspection, you will perceive that although there is labor in breathing there is not much motion of the parietes of the chest (10); the muscles of the neck, however, are strained and often hypertrophied. On applying your ear to the chest, the wheezing becomes still more manifest, perhaps obscuring the natural respiration; occasionally the sonorous râle is heard (62). This state of things continues, perhaps, for a week or more, unless remedies of an expectorant nature are used; under the influence of which a secretion of mucus takes place, the crackling râles (68) come on all over the chest and some relief is obtained from the severe dyspnœa, &c. If no relapse takes place, the patient recovers from the acute attack in a

week or fortnight longer. But the habitual liability to dyspnœa remains, with a rounded swollen aspect of the chest (8), and increased resonance on percussion,(96) and somewhat diminished respiration.



PHYSICAL SIGNS OF PULMONARY APOPLEXY.



DISEASE of the lung, commonly, since the times of Laennec, called pulmonary *apoplexy*, from its consisting of a deep congestion with extravasation of blood into the cellular structure of the lungs, is a very rare disease. When severe, it causes dullness on *percussion*.

184. Absence or roughness of the respiratory murmur in the part (28).

185. Crackling around the edges of the diseased part (68).

186. There may be a slight alteration in the resonance of the voice, when compared with the sound in the healthy lung (80).

187. EXAMPLE. Hæmoptysis happening in a case, which you are satisfied is not tuberculous, is the only sure sign of apoplexy of the lungs. The physical signs will give you the extent of the disease. As an idiopathic disease it is one of the rarest we meet with.

PHYSICAL SIGNS OF DILATED BRONCHI.

By dilatation of the bronchi, the voice becomes more resonant (51, 52) and even pectoriloquy is caused, if one tube be very much enlarged.

189. A bronchial (41), or perhaps cavernous respiration is heard (42).

190. A constant mucous râle for some months, always heard in one particular spot at the base and posterior part of a lung, in a person not very ill, is sufficient to make one suspect the disease (76).

191. Percussion is not materially altered; if at all altered, it usually is slightly diminished (98).

192. **EXAMPLE.** A youth walked into my room and said he had been quite well until five minutes previously, when he had hæmoptysis. On inquiry, I found that in early life he had severe pulmonary symptoms, but that since that he had been usually in good health, though liable at times to a cough. As the hæmoptysis was slight, I expected to find little or no physical signs. I was surprised to find that he had cavernous (42) and bronchial (41) respiration, with pectoriloquy (52) and bronchophony (51) throughout the whole of the left lung. This side had a contraction as from

old pleurisy (142). I inferred that these signs of the respiration and voice were of a chronic nature and not at all connected with his acute attack. Otherwise, I should have been obliged to suppose hepatization and cavities to have come on in the young man without previous sign. The contraction of the chest confirmed my suspicions. My explanation was, that in former times, when younger, the lung had been compressed, and upon recovery from the pleurisy, the pulmonary parenchyma not being able to expand itself, owing to firm lymph over and in it, the bronchi had yielded to the pressure of the external atmosphere, and had become dilated in proportion to the absorption of the fluid in the pleura. Three months afterwards the young man died of tubercles developed in the other lung, and the bronchi, enormously dilated, filled up the major part of the lung over which we had heard the tubal sounds, &c.

193. Dilated bronchi may deceive you and lead you to think that the case is one of phthisis. I should have been deceived, had I not examined the man above-mentioned within five minutes after the hæmoptysis occurred. If I had seen him a week or fortnight afterwards, I might have imagined a condensed lung, or even that cavities had been formed. There is no sure defence against this error. You must examine accurately all the ra-

tional symptoms and compare them very carefully with the physical, and usually you will be able to decide correctly. However, a dilatation such as the above very rarely occurs. I have never met with another case. In making up your mind you must have reference to the spot in which the râles are heard. If heard in the lower portions of the lungs, where they are heard usually in dilatation of the bronchi, you will of course have less fear of phthisis. If at the apex, the physical signs may absolutely deceive instead of helping you (143, 162, 80, 81).

PHYSICAL SIGNS OF ŒDEMA OF THE LUNG.



ARELY do cases of œdema of the lung produce any change of sound on percussion, or if at all altered it is but slightly diminished. At times there is merely a *change of note*.

195. The vesicular respiration is usually obscured by a minute crackling (70) heard in 10 (*fig. 18*), most distinctly, because that is the posterior and lower part of the organ.

196. The resonance of the voice is normal.

197. **EXAMPLE.** Pulmonary œdema, as a *idiopathic* disease, I have never seen, and do not believe in its existence. It is usually a consequence of some malady that causes dropsical effusions elsewhere : such as a disease of the heart, tumors, &c. You will generally hear a crackling that is fine (70), such as is observed in pneumonia, but usually it is louder and the bubbles seem larger, and more moist (sub-crepitous, 73). These signs may last an indefinite period of time ; they may cease, under remedies, producing absorption, and subsequently reappear.



COUGHS, HAVING NO PHYSICAL SIGNS.

THESE cases are different from bronchitis or phthisis, without signs, (105). But they have frequently made me anxious about a patient, because they made me suspect phthisis ; and I have no doubt they will trouble you. I have met this symptom, commonly, in females below the middle age. Usually the throat has been complained of, and on examination the fauces have appeared red. The cough has been loud and

“*barking.*” Warm weather or a change of air has commonly relieved it, but it has always been most inveterate and intractable under the use of remedies. It has been connected with no other severe symptom. There is still another class of patients; viz.: the distinctly nervous. In one of these cases, I have known aphonia and a most violent cough to last for months, and then suddenly disappear.

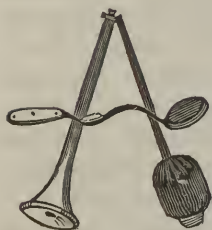
199. The diagnosis in these two classes of cases is sometimes difficult. Yet, if we are accurate in the investigation of the rational and physical signs, we shall generally be able to decide. In the former class, the fact that the cough exists as a *single* symptom, or with nothing connected with it save some wandering pains about the chest, after a fit of coughing; and in the latter category, the nervous, hysterical, character of the patient, and the absence of all physical signs about the lungs in both, are generally sufficient indications to an accurate diagnosis.

PHYSICAL SIGNS

RELATING TO THE

CIRCULATORY ORGANS.

CIRCULATORY ORGANS.



ALMOST all the physical signs of diseases of the heart are less sure indications of the kind and degree of disease of that organ, than the physical signs found in diseases of the lungs are indications of the characters and degrees of disease in them. If you keep this remark in mind while reading the following rules, and carry it into your subsequent practice, you will save yourself from many a hasty and erroneous diagnosis.

201. The rules in regard to the position, &c. of the patient (1), apply to the examination of cardiac diseases, as well as to that of pulmonary complaints.

202. If the examination is made with the patient in a sitting posture, the heart falls downward about an inch lower than it is when he is lying on the back; it is also tilted forward. Hence arise differences on percussion, auscultation, &c., the signs being lower in the erect than in the horizontal posture. There will likewise be greater dullness on percussion in the erect than in the horizontal position.

203. In examining the heart, *mediate* is usually better than *immediate* auscultation (18), for with the stethoscope you can examine small spots, without being confused by the sounds from the adjacent parts. This point, as we shall see, is of much greater moment in auscultation of the heart, than in our examination of the lungs. Dr. Pen-nock recommends very strongly the flexible stethoscope. I have never found it necessary (22). In our examination of the circulatory organs we make use of *inspection*, *palpation*, *mensuration*, *auscultation*, *percussion*, and finally, if need be, *auscultatory percussion*.

INSPECTION.

INSPECTION commonly shows a very slight motion of the heart, that is perceptible about the sixth rib; but in a case of hypertrophy, or of dilatation of the heart, or of aneurism (10), the pulsation may become much more manifest. The neck also should be observed, because various diseases of the heart produce a great pulsation of the carotids, or of the jugular veins, in which there is usually but little if any motion manifest to the sight (10). At times, though rarely, a tumor forms either in the back or front, in consequence of an aneurism pressing through the ribs (8). In pericarditis, with effusion, there is prominence of the left breast, and the left nipple is somewhat raised (8). In hypertrophy the apex strikes a little outside and higher up than the spot it usually appears in (275). Sometimes, a tumor may form over a great vessel and cause a pulsation to be perceptible. In such a case, nice diagnostic powers will sometimes be needed.

PALPATION.




PALPATION should be attended to in all diseases of the heart.

205. In health, there is little or no impulse felt when the *fingers* are placed over the apex of the heart, between the fifth and sixth ribs on the left breast. In diseases, hypertrophy and dilatation, especially the former, you may get a very strong impulse, even through the clothing. It may, moreover, be observable over a much larger space, even the whole of the left breast (275). In pericarditis with effusion all impulse is destroyed (260). It is very feeble in some fevers of a low type (215). It is sometimes intermitting. In some old persons it is always so. Great irregularity in an acute or chronic disease is always a bad sign. Aneurism of the aorta may cause a pulsation through the sternum about the second or third rib (336). Or behind the clavicle we may find it in aneurism of the subclavian (347), and near the lower part of the back in disease of the descending aorta (346).


206. Palpation gives the peculiar thrill called *fremissement cataire*. It is so called because it produces to the end of the finger, gently applied to a part, a sensation similar to that felt on the chest of a cat that is purring. It is most distinctly per-

ceived over some aneurisms of the arch of the aorta. It may however be felt in various valvular diseases of the heart. It usually indicates serious obstruction of the blood in its passage through the heart (14.)

MENSURATION.

OME use mensuration, but in comparison with inspection, auscultation and percussion, it is rarely of much use in diseases of the heart (19, 17). An instrument, named cyrtometer, has, however, been recently invented by a French writer, to mark more accurately than can be done with the eye, the various prominences over a heart that is diseased (262).

AUSCULTATION OF THE HEART.

ELICATE changes in the sounds and impulse of the heart are the chief elements in cardiac auscultation.

209. The sounds are either *natural, diminished, augmented, absent, increased in number, irregular, changed into or accompanied by abnormal characteristics.*

210. The *natural* sounds are two; the first is dull and hard, and most distinct below left nipple, about the fifth rib; the second is sharp and quick, and most evident about the median line and between the second and third ribs.* The *first* sound depends upon many conditions, the most important of which is the muscular contraction of the ventricles. But besides this are the motion of the mitral and tricuspid valves, the impulse of the heart against the walls of the chest, contraction of the auricles, the rush of the blood from the ventricles, all having an influence. The second is owing to the regurgitation of the blood in the aorta and pulmonary artery against the semilunar valves in those vessels.

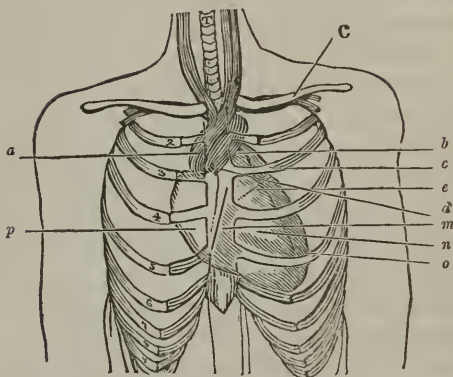
211. The sounds in health take place in *regular order*. From the commencement of the first sound to its return, a little less than a second of time is occupied. Of this, one half is occupied by the first sound, the next quarter by the second and the last quarter by a period of almost entire rest. Dr. Pennock states that the sounds over the right cavities are of a "more clear flapping" character than those over the left.

* Dr. Williams represents them by the words "Lubb tup." I should prefer "Lubb tuk." Pronounce these and apply your ear to a healthy heart, and you will understand this description.

212. The sounds are of course heard most distinctly over the spots where they originate. Thence they radiate, being generally heard less distinctly over the right breast than over the left. On the back, they are perceived somewhat along the course of the aorta, at the left of the vertebral column, and generally more clearly throughout the left than the right back. At the top of the right back, they are scarcely perceptible. We may add that the second sounds, whether healthy or diseased, are transmitted along the aorta and pulmonary artery more readily than elsewhere.

213. The following diagram, taken from a larger drawing, made under the direction of Dr. Pennock of Philadelphia, will serve to show the position of the heart, and of its valves with reference to the sternum and to the ribs, during life, when fully distended. It will be well to study carefully this diagram in order to get a definite idea of the various parts in which we should auscult in order to hear most clearly the sounds from the different valves.

Fig. 29.



a Vena cava descendens.

b Pulmonary artery valves, lying midway between the second and third ribs, half an inch from the left edge of the sternum.

c Left auricle, only a small portion of it visible above the third rib.

d Aortic valves, lying under the median line of the sternum, and on a level with the lower edge of the third rib.

e Mitral valve, represented by, lying between the point of union of the third rib with its cartilage, and the upper edge of the junction of the fourth cartilage with the sternum.

m Tricuspid valve, represented by —, extending under the sternum from a little below the level of the third rib of the left side, to the lower edge of the fifth rib of the right side.

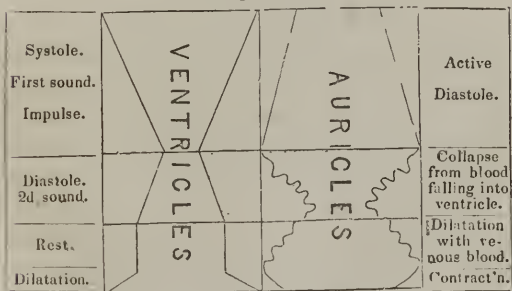
n Right ventricle.

o Left ventricle, almost concealed by the right

p Right auricle, distended and fully seen.

214. The following diagram drawn from the descriptions by Drs. Hope and Pennock of the actual motions of the heart, shows the *times* at which the different sounds are made and the impulse occurs; their relation to the periods of systole, diastole and rest; the relation of the systole, diastole, and rest, to each other and to the impulse felt externally. The *converging straight* lines indicate *active contraction*; the *diverging* indicate *active dilatation*; the *parallels* point out a *state of rest*; the *waving*, converging and diverging lines indicate *passive contraction* and *dilatation*. Supposing the pulse to be at sixty per minute; one half a second will be occupied by the ventricular systole, and this causes the impulse; one quarter of a second will be occupied by the diastole, and the same time by the state of rest.

Fig. 30.



INFERENCES FROM THE ABOVE.

214 *a. First.* While the ventricles are contracting, the auricles are dilating.

214 *b. Second.* While the ventricles are dilating, the auricles passively collapse, and allow their blood to flow into the ventricles, during about two thirds of the period of the diastole, when the veins begin again to fill the auricles.

214 *c. Third.* During the period of ventricular rest, the auricles are gradually distending; until, finally, becoming swollen to their utmost, they contract with a sudden jerk. This throws a little more blood into the ventricles, previously nearly filled by the blood that had fallen into them from the auricles, and they are again stimulated to active systole.

THE SOUNDS OF THE HEART.

215. They are *diminished* in cases of debility, when the *heart is soft or flaccid* (205), as in fevers; also, in some cases of hypertrophy, (275), when the heart moves with difficulty, as from congestion; also, in pericarditis with effusion (260). Simple diminution of the sound is not, however, sufficient to enable us to decide upon the existence of disease, or upon the nature of it.

(216) They are *augmented* after exercise, in inflammatory excitements of the system, mental emotion, &c. ; in some nervous patients they are heard sometimes at a distance of two or three feet from the patient (Andral). Formerly a loud sound was considered an evidence of dilatation of the heart, but now it is considered to mean nothing of itself (277).

217. I have known an individual, a chlorotic patient, in whom, frequently, the first sound was wholly *absent*, and returned only after some hours. This patient was able to work, and had no very evident signs of organic disease. The absence of sound was probably owing to the sluggish contractions of the ventricles.

218. The sounds sometimes are *three and even four in number*, owing probably to a want of harmony between the two sides of the heart ; for of course there must be four sounds ; but similar parts contracting at the same moment only two are heard ; or perhaps they are owing to unequal repetitions of the ventricular contractions. Bouillaud says, that this change in the number of sounds heard, is indicative of serious disease of the heart or pericardium.

219. *Irregularity* of the sounds and motions of the heart may exist without organic disease. By itself, therefore, especially if not permanent, it is

of little importance, but it becomes a more serious symptom when combined with other signs; such as increased dullness on percussion, and the various types of bellows murmur, &c. (223). Many old persons have this irregularity as a constant symptom, while in health, and, what seems at first sight very peculiar, they have regular pulsations only when affected with some acute disease.

ABNORMAL SOUNDS OF THE HEART.

220. Among the abnormal sounds none are so striking as the *bellows murmur*. It may be present without serious organic disease. For example: it is heard at times in patients enfeebled by any cause; it is very frequent in chlorosis and after severe hæmorrhage. It may be caused, in peculiar constitutions, by any over-exertion by which the respiration is accelerated, such as running, going up stairs, coitus, &c. In general, it may be said to be, *at times*, produced by any functional or organic change which, without absolutely causing disease of the heart, may yet obstruct its motions (315).

221. What I have stated above applies *almost* exclusively to the mildest form of the bellows murmur.

222. There are several degrees to this sound, which, although they are called by different names, as they may run into each other, and may all be

caused by the same disease, I prefer to consider as one sound, varying in its greater or less degree of harshness.

223. In its mildest form, it is slight, short and breezy, the slightest *prolongation of either sound* of the heart (311 *bruit de souffle, Fr.*). Then comes the pure *bellows sound*, and its name sufficiently indicates its characteristics (*bruit de soufflet, Fr.*). The *filing sound* (*bruit de rape, Fr.*) also indicating its nature by its appellation, first gives the decided roughness (289). Finally, we hear the loudest and roughest of the whole, viz : the *sawing sound* (*bruit de scie, Fr.*). The last two, rarely exist as constant symptoms, unless they are caused by some organic disease of the heart (297).

224. Occasionally all these sounds have a musical note, resembling the cry of a young bird, which is sometimes heard some inches from the chest.

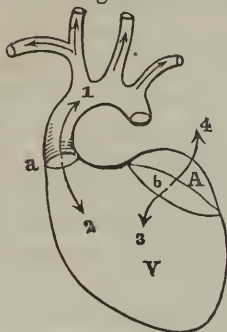
225. The causes of this sound are, according to Andral, 1st, any difficulty in the passage of the blood through one of the orifices ; 2d, a reflux of the same through the orifices ; 3d, some modification in the play of the valves ; 4th, some unnatural contraction of the muscular fibres of the heart ; 5th, increase of its impulse ; 6th, some tumor compressing it ; 7th, obstruction by adhe-

sion of the two layers of the pericardium ; 8th, chlorosis, &c. various diseases of the system. I will add to the above, that I have met it under the clavicle in some early cases of phthisis. Dr. Graves has heard it in pneumonia. I presume these cases may, however, be referred to the first cause mentioned by Andral. A most formidable number of causes truly for a young auscultator to decipher ! Be of good courage ! The mystery will, generally, be easily unravelled if you truly study a case ; or, if it is not, you will not be worse off than your elders (312 to 315).

226. These sounds, when constant, *usually* indicate a disease of the valves of the heart of such a character, as to cause a disturbance in the current of the blood ; and as such diseases may either *obstruct* or *allow of a regurgitation* of the current, it becomes necessary to study the morbid sounds arising therefrom with reference not only, 1st, to the spots where they are heard, but, 2d, to the time at which they occur ; whether before, during, or subsequent to, the action of the parts that cause the healthy sound.


227. The following diagram serves to illustrate the *places* we have been speaking of. This plate represents the outlines of an auricle and ventricle with the aorta and its branches. A. auricle, V. ventricle ; *a* aortic orifice ; *b* auriculo-ventricular

Fig. 31.



orifice. The direction of the arrows represents the currents; hence it is evident *obstruction 1* of the aortic orifice would be heard more up the aorta than in the ventricle (297), while an *insufficiency* of it and consequently *regurgitation 2* would be

slighter and rather more down in the ventricle, though by no means absent along the course of the aorta (302). *Obstruction 3* of the mitral valve would produce a very slight sound, and it would be heard chiefly over the left ventricle as its focus and but slightly, if at all, along the carotids (283). *Insufficiency 4* of the same would be louder; but over the ventricle chiefly; and much less distinct, or, perhaps, absent along the carotids (289). Similar statements might be made in regard to the tricuspid and the pulmonary artery valves (294, 296, 307 309).

227.  N. B. All these remarks must be taken with limitations; for, in actual life, we can rarely analyze the sounds so clearly. I have seen a case in the hospital at Boston, in which there was a strong bellows murmur for some time, but no dis-

ease of the valves was found at the autopsy ; simple hypertrophy of the heart and obstruction of the blood in the lungs, were the marked conditions. But the most remarkable case, as a *caution*, is that given by Dr. Graves,* in which there was disease of the aorta with bellows murmur over the *ventricles*, and *none over the aorta*. Nevertheless, for definiteness of *purpose*, as an auscultator, it will be well to *study* the diagram and the remarks thereupon.

228. The following diagram is intended to present an idea of the *times*, at which these sounds occur with reference to the various movements, the sounds and the impulse of the healthy heart. It is, in fact, the same as *fig. 30*, (214), and represents exactly what that did, but, in addition, gives the times of the *morbid valvular murmurs*.

Fig. 32.

From obstruction of semilunar valves.	VENTRICLES	AURICLES	From insufficiency of auriculo-ventricular valves.
From insufficiency of semilunars; sounds lasting at times thro' this period.			From obstruction of the
			auric. vent. valves.

* Clinical Medicine, page 922, Dublin, 1843.

228 *a.* From this diagram we perceive, *first*, that morbid murmurs, from *obstruction* of the semilunar valves, occur during the ventricular systole, and near the time of the impulse of the heart ; that murmurs from *insufficiency* of the same valves immediately succeed the systole and impulse, and that, if the disease is severe, the sounds may continue until the next systole, thus causing a continuous bellows sound.

229. *Second.* That murmurs, from *obstruction* of the semilunar valves of the aorta and of the pulmonary artery, occur at the *same time* with murmurs from *insufficiency* of the mitral and tricuspid valves. How then are we to decide between them? By observing the *places* at which the healthy sounds are most distinct (*fig.* 29), for those spots are the *foci* of the morbid sounds, and, moreover, by remembering that the aortic and pulmonary artery sounds are, generally speaking, transmitted up along their respective canals, *fig.* 31 (227), whereas the auriculo-ventricular murmurs are chiefly limited to the ventricles (290, 297).

230. *Third.* We see that sounds, arising from *obstruction* of the semilunar valves, or *insufficiency* of the *auriculo-ventricular valves*, will generally be louder than others, because produced by the strong contractions of the muscular ventricles.

231. *Fourth.* We can understand how a sound,

from *insufficiency* of the semilunar valves of the aorta especially, may be continued through not merely the diastole, but the period of rest of the ventricle.

232. *Fifth.* From the slight spaces of time left for the feeble contractions of the thin auricles, it becomes evident that only a slight murmur can be produced, even where there is considerable disease of the valves. This actually occurs, and all morbid sounds are sometimes imperceptible, even when there is a very great *obstruction* of the auriculo-ventricular orifices.

233. *Sixth.* It is plain that a murmur from *obstruction* of the auriculo-ventricular valves may occur at the same time with the second sound, or just before the first. By some, it is said to occur most commonly at the latter time. A priori, one would be induced to think so from the fact, that there is then an active contraction of the auricle. I believe, however, it may occur at both periods.

234. *Aortic sounds from obstruction* have been said by Dr. Hope (297) to resemble the whispered "s" or "r," and to be very superficial. *Aortic sounds, from insufficiency* of valves, resemble the word "awe." Murmurs from *obstruction of auriculo-ventricular* valves resemble "who"; those from *insufficiency* of the same valves have the same tone, but they are much louder, and more frequently heard (302, 294, 289).

235. A late French writer speaks of a *parchment*-like character to the sounds of the valves, which, though difficult of description, is very distinct to his ear, and indicates an hypertrophy and thickening of the valves; not, however, in so great a degree as to cause any real obstruction to the passage of the blood; not enough to prevent these valves from fully performing their functions. I am not aware of having ever heard it.

PERICARDIAC SOUNDS.

235 a. In health there are none. In disease some appear that are of infinite importance in enabling us to form a correct diagnosis.

236. *Sound of new leather (bruit de cuir neuf)*. This sound is heard in the earliest * stages of pericarditis (258). It is not very common; therefore you must not be surprised if you do not hear it. It is like the creaking of new leather; and it is heard when the two layers of the pericardium are rough and stiff from inflammation. It disappears when an effusion of fluid takes place into the pericardial sack; because, of course, the two layers are then separated.

* Dr. Graves (Clinical Med., 910, Dublin, 1843), mentions a case in which a distinct musical murmur preceded the creaking sound.

237. *Pericardial rubbing sound*, called by some writers *to and fro sound*, occurs in pericarditis (259) with effusion of lymph; or in any disease of the heart that causes a roughness of the pericardial layers. In pericarditis, it may be heard at the beginning of the disease, and follow the leather sound; but it usually appears later in the disease, when the absorption of a quantity of liquid previously effused, allows the two layers to come in contact (263). It resembles in its characters the rubbing sound heard in pleurisy (128); and it is very superficial. It may be distinguished from pleuritic sounds by causing the patient to hold the breath, and then the sound will evidently be perceived to occur during the action of the heart. Occurring after a large effusion in pericarditis, it is, in some degree, a favorable sign; though some writers doubt whether any adhesion of the pericardium, of which this sound is the forerunner, can be otherwise than unfavorable.

238. Sometimes in case of an effusion of fluid into the pericardial cavity there is a washing or churning sound heard (261 *b*). It is of little importance, and rarely heard.

239. All these pericardiac sounds are said to be *more superficial, and are more subject to changes than the valvular murmurs. I think that such is the case.

* Graves' Clinical Medicine.

THE IMPULSE OF THE HEART.

240. The other element used in auscultation of the heart is the impulse. This is usually very slight. It is synchronous with the contraction of the ventricles, and almost synchronous with the radial pulse. In health, it is scarcely perceptible, and felt in a very limited space between the fourth and sixth ribs, on the left breast (205).

241. Like the sounds of the heart, it may be *natural, diminished, absent, quickened, augmented in force, or irregular.*

242. It is *diminished* in various diseases, as softening of the organ in fever; by pericardial effusions (260); and usually by dilatation of the heart (277), and an emphysematous lung, projecting over the heart, may produce this effect.

243. It is sometimes *absent*, under similar, but more severe, circumstances; for instance, pericarditis (261 *a*) with effusion and hydro-pericardium may push the heart away so that it cannot reach the parietes.

244. It is *quickened*, by emotions of the mind; by all acute febrile diseases; by great hæmorrhage; by the approach of death, &c.

245. It is *augmented in force* by those conditions that quicken the sounds and impulse. But it is most strikingly increased by hypertrophy

(275); and, in this case, it frequently extends over a much larger space than usual, and may be so strong as to jar the bed on which the patient lies.

246. *Irregularity* is sometimes *natural*; that is, persons are subject to it from their earliest years, and it is not then a serious symptom. A curious circumstance in these cases is that usually during an attack of disease the pulse becomes regular. Old persons are peculiarly liable to this. Under other circumstances, when combined with other rational and physical signs of disease, it may be of great moment as indicative of valvular disease (258, 292). I think it not very uncommon to meet with idiosyncrasies in children in whom irregularity occurs in any disease. If no other sign is present, in these cases, I care but little for it.

PERCUSSION OVER THE HEART.



DIFFERENCE of *note* (99) is usually perceptible, in healthy persons, between the two breasts, the left being rather duller than the right. The space, in which this difference is perceptible (93), begins on a level with the second

rib and about a finger's breadth from the left of the sternum, and gradually widening on the sixth rib, it may be there two and a half or three inches broad ; viz.: from the right side of the sternum over to within one inch of a line let fall from the left nipple. This space is, at times, no where completely dull : but generally there is a small spot, at its lower part, about the junction of the left ribs with their cartilages, that is evidently flat. In health, this flatness never extends outside of the left nipple (260), and you may be sure either that there is displacement of the heart or that some disease, as pericarditis or hypertrophy, exists, if you find it more extensive (275). The position of the patient has considerable influence, the dullness being augmented when in an erect posture or when leaning forward ; and, of course, the flatness extends towards either side that the patient may be lying upon.

248. Various diseases of the *lung* modify it. Emphysema tends to make more resonance over the cardiac region (177). Pneumothorax does the same in a more marked degree, and at the same time usually presses the heart out of its usual place (166). Pleurisy, with large effusion, likewise tends to thrust the heart from its usual place (130), and augments the cardiac dullness. A distended stomach will sometimes encroach upon the

cardiac space, and cause increased clearness, or dullness, according as it is filled with air or food. The liver, when enlarged, also encroaches in the same way, always, of course, augmenting the dullness (See Auscultatory Percussion, 389).

248 *a*. Its own diseases modify the sound on percussion. Pericarditis, with effusion of fluid, (260), and rupture of the heart with an effusion of blood into the pericardium, hypertrophy (275) and dilatation (277) all augment the space of dullness. Endo-carditis is said by some to produce the same effect (271). Atrophy of the organ will of course diminish it. Some talk of air in pericardium. It has never been my fortune to meet it.



ARTERIES.


INSPECTION OF ARTERIES.

INSPECTION in diseases of the heart (275, 292) very frequently affords a visible increased pulsation of both carotids. A similar local pulsation in any part may lead to the suspicion of aneurism (335).

250. A tumor over the artery may, however, cause a similar pulsation; hence arises a necessity for a cautious diagnosis. Chlorosis is apt to produce local pulsations, in the carotid or cœliac arteries, for example (280).



PALPATION OF ARTERIES.

IMPLE increased throbbing in a part indicates merely increased action; an aneurism may give, in addition to a pulsation, the peculiar thrill called purring sensation (*fremissement cataire*) (14, 206); this, however, is not constant. The examination of the radial pulse is of the greatest importance in all diseases of the heart. It *suggests* at times, by its irregularity, either organic changes in chronic diseases, or an inflammatory condition in acute attacks (246). A full pulse, in any chronic trouble of the circulation, points at hypertrophy, and usually without great obstruction of the aortic valves (275). A small, irregular, or dicrotic pulse indicates a disease of the mitral valve, preventing the free passage of the blood from the auricle into the ventricle, and consequently a double beat is liable to occur (292.)

MENSURATION OF ARTERIES.



ENSURATION is never used save in the case of a great prominence of some aneurism, as of the arch of the aorta (344), the abdominal aorta, or of the popliteal artery.



AUSCULTATION OF ARTERIES.




y auscultation we always obtain a very slight sound, and an impulse over the various arteries of the body. These indicate nothing of importance ; but, in cases of aneurism, a strong local sound (340) is heard and an impulse is (336) felt in the part, if it cause any prominence of the external skin (344, *fig.* 34). A tumor, over a healthy artery, *may* produce the same effects (343). A bellows murmur not unfrequently attends a local aneurism. This sound used to be considered very important as indicating aneurism. At present, it has much less value, except when connected with other signs of the same disease.

254. Chlorosis (220), prolonged hæmorrhage, and an hæmia or any undue pressure of the stethoscope frequently produce bellows murmur in the arteries (220); hence, be wary of inferences drawn from this murmur merely, however rough may be its character.



VEINS.

INSPECTION OF VEINS.

ULSATION of the jugular veins is not unfrequently the result of any severe disease of the heart, causing patency of the tricuspid valves, and consequently a regurgitation into the auricles and veins (296). A similar phenomenon is observed in some peculiar cases in which the capillaries of the body seem to allow the force of the heart's action to be continued directly through them into the veins. The two may be distinguished by the fact that the course of the current of blood is, in the former case, contrary to its usual course; while in the latter it is only the natural current augmented by slight pulsations.

PALPATION OF VEINS.



DISEASE of the veins is never recognised by palpation alone, but this method affords generally similar results to those given in the last section.

AUSCULTATION OF VEINS.



RARELY is there any sound produced in the veins; but in certain cases, for example, in chlorotic females: in hæmorrhagic, and in anhæmic patients; in all, in fact, who, from any cause, have less fibrine than usual in the blood, a sound called *bruit de Diable* or Devil's noise, is heard (311). It was named by Bouillaud and resembles the sound produced by a toy. It is similar to the bellows murmur of the arteries, except that it is continuous. It becomes, in very marked cases, musical in its character, reminding one of

the whistling of a violent wind. It is very variable, and depends much upon the degree, and peculiarity of pressure, exerted by the stethoscope on the vein. Under too great a pressure it wholly ceases. I think I have observed it most distinctly when only one edge of the instrument has rested on one half of the right external jugular. It is augmented when the vein and sterno-mastoid muscle are made tense, by turning the head strongly to the side opposite to that, which you are examining. It is most commonly heard only in the right jugular. In severe cases of hæmorrhage it may appear in other parts. This sound is pathognomonic of no serious disease.

PHYSICAL SIGNS OF PERICARDITIS.



URING the *first* stages of the disease; that is, before any effusion of fluid has taken place, a *musical murmur* has been heard by Dr. Graves* (236). I never heard it; but when the two

* Clinical Medicine, Dublin, 1843, page 910.

layers of the pericardium are dry, and move less freely than usual upon each other, owing to their congestion, the sound like the *creaking of new leather* (*bruit de cuir neuf*), may be heard anywhere in the cardiac region * (236). Probably, there will be some irregularity in the motions and sounds of the heart, and perhaps, though rarely, a slight prolongation of the first sound (223), owing to the difficulty that the ventricles have in contracting. All these signs may be absent, or they may be of so short a duration, that we may not have any signs but those of a later date.

259. *Second.* A *rubbing* or *to and fro* sound (237), similar to that heard in inflammation of the pleura (128), occurs when lymph has been thrown out, and the pericardial layers have been made very rough thereby. This sound is much more frequently heard than the signs already described. When any difficulty arises as to whether the sound is caused by the heart or by the pleura, if you request the patient to hold his breath, you will be usually able to decide, for if it be caused by the heart the sound will continue. It is liable to the same varieties observed in pleural and other rubbing

* This will vary in character, from a gentle sound, like the rustling of silk, to a rasping, grating, or croaking. (Hope on Diseases of the Heart, p. 175, Pen-nock's Edition.)

sounds.* Some say that in this stage a bellows murmur (223) is, at times, heard. It may be so (77); but were I to hear a distinct bellows murmur I should suspect endo-carditis (269.)

260. *Third.* These sounds will all disappear, and instead of them you will have (in consequence of an effusion of fluid taking place into the pericardial sack), an indistinctness of the sounds of the heart and a great diminution, if not an entire absence of the impulse. The latter happens when the effusion is very great. The space usually dull (248 a) becomes two, three, or four times larger than usual. If you find dullness outside of the nipple, you may be sure that considerable effusion exists. Sometimes a vibratory tremor is felt in this case.†

261. *Fourth.* The respiratory murmur is very much obscured; or if there is a large effusion, and the lung is pushed aside to a great extent, there is an entire absence of the sound. I have known this want of the respiratory murmur to be observ-

* A man died a short time since at the Massachusetts General Hospital in this city, over whose liver was felt and heard a rubbing sound resembling the creak of new leather. It occurred on any motion of the parts. At the autopsy a very delicate membrane was found covering the liver. It was not rough, and scarcely explained the phenomenon.

† C. J. B. Williams's Lectures.

able from the second rib to the base of the chest, and from beyond the right edge of the sternum to the outside of the left nipple.

261 *a*. With this diminished respiration there will be a diminution of the *sounds* and of the *impulse* of the heart. The latter, in fact, may be wholly lost, if the pericardium is very much distended (215, 242, 243).

261 *b*. At this period likewise is sometimes heard a *washing* or *churning* sound, caused by the motions of the heart in a fluid (238).

262. *Fifth*. You will perceive a prominence of the left breast, when compared with the right, and a pressing out of the intercostal spaces in the cardiac region (204). *

263. *Sixth*. As the effusion subsides, and convalescence from the acute disease commences, all these signs will begin to disappear : and, finally, when the layers of the pericardium come again in contact, we may hear as in pleurisy (128, 237)

* It has been proposed to use a "*cyrtometer*" to measure the prominence caused by any disease of the heart and its membranes. (Manuel de diagnostic des maladies du cœur précédés de recherches cliniques pour servir à l'étude de ces affections, par le Docteur Felix Andry). I have never seen the instrument, but it seems to me that inspection will generally afford us all the information that is really necessary.

the rubbing sound again, and it is favorable so far as it indicates diminution of the effusion (237). This rubbing sound may begin in one spot, for instance, near the junction of the third rib with the sternum, and extend thence over the whole cardiac space, or it may be limited to a small spot.

264. *Seventh.* Finally, when convalescence is fully established, all the signs may disappear, and all the operations of the heart may become perfectly normal. Irregularity of motion, &c. may however remain, and gradually hypertrophy of the heart will probably ensue, with all its train of severe physical and general symptoms (275, 6).

265. At times, after an effusion and the consequent contraction of the adjacent parts, it is said that there is a drawing in of the intercostal spaces at each movement of the heart.

266. *EXAMPLE.* Nothing is more indefinite than the *rational* signs of pericarditis. It is impossible to be sure of its existence, unless we have recourse to the physical signs. A most common case is as follows. A man is seized, either when healthy, or, more commonly, when affected with rheumatism, with a pain, either very severe or very slight, about the cardiac region. This is the more common case. At times, however, there is no pain. Dyspnœa may come on, and, though it is usually slight, it may become orthopnœa.


With these *may* come other, more or less marked, signs of trouble in the circulation ; such as dizziness, œdema of the legs, &c. ; but all these symptoms *may* be absent, and the disease would be *wholly latent* if we did not have the physical signs to inform us of its existence. If you happen to see the patient quite early, you may obtain only signs of some obscure disease about the circulatory system ; but of what character you may be doubtful. Any alteration either of the sounds or of the impulse, any irregularity of the rhythm, &c. may lead you to *suspect* pericarditis or endo-carditis. If *any* physical sign be combined with any local rational sign, such as a pain in the region of the heart, or palpitation, &c., your suspicions would be augmented. If, in connection with these signs, or without them, you hear a superficial *creak* like the sound of *new leather* (236), you may be certain of your diagnosis, and decide that it is a case of pericarditis. Yet it is quite rare to hear this sign ; and if it be absent you must not necessarily infer that pericarditis does not exist. If you hear it, you will, in your mind's eye, see the two layers of the pericardial sack, congested and drier than usual, and hence moving with less ease than ordinary ; yet not sufficiently obstructed to present the next phenomena ; viz. : *rubbing sound* (237), which may come on within forty-eight hours from the

first attack. Hearing this, either locally, about the third and fourth rib, near the sternum, where it would be most likely to commence, or, generally, over all the cardiac space, you may be morally certain that you have pericarditis to deal with and that the opposing layers of the pericardium are even then covered with a tolerably dense, and moist membrane, the motions of which, upon each other, produce the sound in question. This is the last moment for active, efficient treatment, if you have not used it before. At this period you may perceive some obscurity in the movements of the heart (205); little or no increased dullness on percussion (248 *a*). In a few hours, if the disease be not checked, an effusion of fluid will take place and will separate the layers, push back the heart, destroy the rubbing sound, and you will have instead, great diminution in the strength of the sounds of the heart (215); absence of impulse (243); perhaps a sort of churning or washing sound (238), in consequence of the dashing of the fluid against the walls of the distended sack; dullness on percussion, which may extend from the second rib to the cartilages, and from the junction of the cartilage and right ribs to beyond the nipple of the left side (248 *a*); and, finally, an absence of respiration over a large part of the left breast (owing to the pushing aside of the lung), with promi-


nence of the same point (204). These are the most perfect and undoubted physical signs of pericarditis. If the disease is prepared to yield, all these signs will diminish, the prominence will disappear, the dullness on percussion will diminish; perhaps the rubbing sound will be again heard, and then it will be very favorable, as it will indicate an absorption of the fluid (237). It will usually commence near the origins of the aorta and pulmonary artery, and will extend thence over the cardiac space, and may last for weeks; the impulse and the sounds of the heart will be felt and heard more distinctly, and gradually all symptoms will disappear. But this is not the common course, for palpitation usually remains for some time, and not unfrequently will this symptom go on augmenting until the patient will finally sink under the signs of confirmed hypertrophy of the heart (275).

267. *Chronic Pericarditis* presents very much the same signs as those described for the acute disease, therefore it is useless to speak of them. Moreover, they are frequently connected with hypertrophy.

PHYSICAL SIGNS OF CARDITIS.

HE present state of science is such that I doubt whether any one would dare make a differential diagnosis so acute, as the recognition of carditis, uncombined with pericarditis or endo-carditis. And as Laennec and Hope confirm my view, I shall pass on.

PHYSICAL SIGNS OF ENDO-CARDITIS.

ELDOM can we be *entirely* satisfied of the accuracy of our diagnosis of this disease, for there is no perfectly, *undoubted*, physical sign of endo-carditis. But we can make an approximation thereto. The chief sign is a *bellows murmur* (220), either with the first or second sounds of the heart. This is usually dependent upon ob-

struction, by lymph, of some of the orifices of the heart. This bellows murmur, in an acute attack, may vary. Usually it is soft, but it may be very rough, and, generally, unless the affection is relieved, it is so when the disease becomes chronic, and then it may pass through all the phases of this murmur (223).

270. In addition to this, we may have an irregularity and an increase of the impulse (245), owing to the irritation of the organ.

271. According to Bouillaud, you should find an enlargement of the ordinary dull space in the cardiac region, owing to a swelling of the heart as in inflammation of any other part (248 *a*).

271 *a*. Finally ; unless the disease is checked, permanent obstruction or regurgitatory murmurs (226) may appear, with signs of hypertrophy (275).

272. EXAMPLE. This disease is most frequently the result of a rheumatic inflammation of the lining membrane of the heart. Not uncommonly, during this disease, the pains will leave the extremities, and a dull aching sensation, and, more rarely, a severe pain, will be felt in or near the cardiac region. It may be so slight, that, frequently, the patient will neglect to speak of it, and will think himself wholly recovered, so freely is he able to move. Thus daily auscultation is necessary ; and, if endo-carditis is commencing, you

will probably hear some prolongation of the first sound (223). This may, perhaps, be very slight, but more important, from that very fact; because, at this time, you will have the disease, comparatively speaking, under your own hand. Generally, there is not a very marked increase of the impulse of the heart (240, &c.), and rarely an enlargement of the dull space on percussion (248 *a*). This stage may be checked and your patient may get well; the bellows murmur may either subside entirely, or may remain, as a mere trifle, not sufficient to impair the health. This period you may overlook, or you may be unable to check it, and your patient, in a few weeks, will probably complain of palpitation and of some dyspnœa. The bellows murmur then will have become more rough (223) and the impulse stronger (245). Remedies may relieve, but they rarely cure in this stage of the disease; for the lymph deposited on the valves, &c., will have too firmly obstructed the valvular apparatus. The disease may continue for months, and the patient may have the same physical signs and no great deterioration of health; or he may, from inattention to the rules of health, become more ill, and be finally affected with hypertrophy of the heart (275) and the symptoms usually following in the train of this combination. This may be given as an example of an acute attack, but the

majority of cases progress more quietly and the signs are less distinct. For the peculiar sounds, and the results produced by endo-carditis, affecting the various valves, see from 294 to 316.



DIAGNOSIS OF ENDO-CARDITIS, ETC.

DURING most of these acute diseases, it is of no importance whether you make an exact diagnosis, or remain satisfied with the general idea of an inflammation of one or more of the textures of the heart. If you have decided that your patient has an acute inflammatory attack of either the covering (pericarditis), the substance (carditis), or lining membrane of the heart (endo-carditis), do not stop to make an accurate diagnosis, but use your remedies *instantly*. Let them be of the most active character. God speed the most speedy and efficient worker, for either of these diseases *may* entail a lifetime of misery. Endo-carditis is the most formidable; but pericarditis is, generally speaking, of no small moment. Finally, I suspect that they are generally more or less combined; and then you may have their various

signs combined together in the case. But if you want to make a more refined analysis of the signs, the following table may help you. I shall unite carditis and endo-carditis under one head.

PHYSICAL SIGNS.	ENDO-CARDITIS AND CARDITIS.	PERICARDITIS.
<i>Tenderness on pressure of cardiac space.</i>	Usually none.	Sometimes.
<i>Prominence of the chest.</i>	“ “	Decidedly, after effusion.
<i>Impulse of the heart.</i>	Strong, usually irregular, and may give a purring sensation.	Not strong at first, usually ; null when effusion has taken place ; irregularity, not marked ; rarely if ever purring sensation.
<i>Sounds of the heart.</i>	Bellows murmur ; deep-seated ; heard more generally over the chest.	Rarely bellows murmur, especially of a rough character ; and a sound of creaking leather or washing sound, quite superficial and usually more limited.
<i>Results of percussion.</i>	Dullness rarely so extensive as in pericarditis.	Dullness may be very extensive and usually it is great, and if it be not so, the disease is slight.

SIGNS OF HYPERTROPHY OF THE HEART.

PURE hypertrophy rarely exists without some lesion of the valves. Its signs are an increased, heaving impulse (245), moving the whole of the left breast, and perceptible at times, through the clothing; * more dullness on percussion (248 a); a throwing upward and outward of the apex of the heart, and the chief point of impulse is nearer the nipple than in health (204); irregular action, not necessarily but frequently, and in severe cases you will find at times a diastolic or back stroke; diminution of the sounds of the heart (215), and often a soufflet with them (223). If there be hypertrophy of the left ventricle and the aortic orifices be free, a strong impulse may be felt at the carotids, &c. (251). If the same case occur with the right ventricle, a pulsation of the jugulars is frequently felt (255). In severe cases, there is less respiration owing to the lungs being pushed away (261), with promi-

* This is usual, but I have met with a case of hypertrophy in which it was *slight*, owing to an obstruction in the motions of the heart.


nence of the left breast (207). The diagnosis of the varieties of hypertrophy, given by authors under different names, (viz. : first, hypertrophy with a diminished cavity ; second, hypertrophy with the cavity normal ; third, hypertrophy with cavity augmented in size), is of little importance so far as treatment is concerned. In a word, it may be said that, by percussion, you will usually be able to recognise the difference between the first and third, for the dullness will be over a larger space than normal in the third, but of normal size in the first.

EXAMPLE OF HYPERTROPHY.

276. This may occur at any age. When called to your patient, you will probably find that he has been suffering more or less with trouble about the heart. Sometimes the symptoms are very obscure ; perhaps, merely a sense of fullness about the breast ; a tendency to palpitation ; but the general functions of the body may all go on very well, and the countenance may appear even more fresh than usual. In this case, you may have no physical signs save a stronger impulse to the ear (245), and even that may sometimes be mistaken for the result of agitation of mind. As the disease goes on, a greater extent of dullness on percussion becomes perceptible ; the lung seems pressed away ; the action of the heart becomes

stronger; its apex does not strike between the fifth and sixth ribs as usual (204), but higher up and farther from the sternum, or over a larger space than usual. The symptoms are greater; the dyspnœa is more marked; and the general health is less good. Finally, you will have all the distinct signs given above: a heaving impulse over a large space (205); great dullness on percussion (247); diminished sounds of heart *usually* (215); and, generally, some irregularity in the movements (219); and sometimes a strong bellows murmur (223). With these come more severe rational signs, ruined health, orthopnœa, dropsy, &c.

SIGNS OF DILATATION OF THE HEART.

 HERE is dullness over a larger space than usual (248 a). The sounds are sharp and clear so that they are very much alike in character; the impulse is less than in health (242), and much less than in hypertrophy (275). The respiratory murmur is likewise diminished or ab-

sent over a larger space than usual (28). Such are the signs given by authors. But I doubt if any one can always make an accurate diagnosis of this affection. The fact is, it is rarely seen except as connected with hypertrophy. Still it is well to remember it in cases where the sounds are clearer than usual, and both are very much alike, when, according to Williams, they resemble the words "Lup tup" instead of "Lubb tup" (210); for these signs, in any disease of the heart, when combined with a slight, soft impulse, and an augmented dullness on percussion, should lead you to suspect dilatation (242, 248 *a*).

278. The following case illustrates somewhat the effects of dilatation of the heart without serious lesion of the valves, also the effects upon the jugulars from hypertrophy of the right ventricle.

A. B. aged 49, mariner, entered Massachusetts General Hospital, Dec. 31, 1841. He had been a great sufferer from rheumatism, and had had dyspnœa, palpitation, œdema, &c., occasionally for four years. Nine months previous to his entrance, his symptoms had increased, so that he lost the power of laboring, and dropsy had ensued. At his entrance he was evidently suffering from serious difficulty in the circulation. The physical signs noted on the day after his entrance were, impulse of heart, generally, rather feeble with an occa-

sional, very forcible and double stroke (246). Neither sound was prolonged (223), the second was less abrupt than usual. Percussion not dull over a great extent in the cardiac region (247). On the next day, great irregularity of motion (246) and feeble impulse was observed (242). Finally; a slight pulsation of the jugulars was perceived, especially in the right side of neck (255). The patient died sixteen days after entrance, and at the autopsy the heart was found nearly twice as large as usual. The parietes of the right side were twice as thick as usual. Those of the left were slightly hypertrophied, but the cavities of both sides were enlarged. The valves were all well.

SIGNS OF ATROPHY OF THE HEART.



UTHORS speak of this, but I have never seen it so as to be able to recognise it before death; nor do I believe that it will ever cause such serious trouble as to need your attention.

NERVOUS AFFECTIONS OF THE HEART.

I USE this word, *nervous*, for want of a better. You will know what it means after you have been in practice a short time. It is very important that you should recognise these affections and distinguish them from organic diseases. The physical signs are, a normal sound on percussion; increased impulse with a fluttering, disagreeable to the patient (244); at times a variable bellows murmur (223), usually with the first sound and a tendency to a bruit de diable (257) and bellows murmur in the veins and arteries: and not unfrequently a pulsation in the latter (251).

281. EXAMPLE. A chlorotic female, or a nervous or debilitated man, may present these symptoms. The palpitations are so severe as to render life a burthen, but rarely are the severer symptoms dyspnœa and orthopnœa, or œdema found. You may produce all of them by bad treatment. I knew a female who had been bled every fortnight for nearly two years, for, what was supposed to be, severe disease of the heart. She was in a state of an hæmia. The throbbing of the heart and rapidity of its fluttering were extraordinary, and during

her attacks she suffered extremely. In such a case a bellows murmur, sometimes of a very rough character, is heard, but the impulse, in this case, was not felt over a large space, nor was the dullness greater than usual. The patient held her hand over her heart, as if to restrain its motions. She died and no disease of the organ was found. The symptoms are always eventually aggravated by the depleting treatment, and the improvement under the tonic course is one of the most important diagnostic signs.



SIGNS OF VALVULAR DISEASE.

MANY times there is thickening merely, with slight obstruction of the movements of the valves, but not enough to produce valvular murmurs. In these cases Bouillaud* recognises what is called a *parchment-like sound*. I have not heard it; but I can conceive it to be possible to recognise it. As it however does not indicate any very severe lesion of the valves, it is of minor importance (235).

**Maladies du cœur, &c., par le Docteur Andry* (262).

OBSTRUCTION OF THE MITRAL VALVE.



RECOLLECTING that the force, with which the blood is projected into the ventricle, is generally slight, owing to the weakness of the auricular contraction, we might, *a priori*, suppose that to happen which really does occur, viz.: any sound, caused by obstruction of this orifice, is usually imperceptible, and it is at all times very slight. Consequently, you *may*, at an autopsy, find evidence that there must have been serious obstruction to the blood passing from the auricle into the ventricle, when there has been no sign to mark it during life. It would be most manifest just before the first or dull sound (233), and would be very likely to be continuous with it. By referring to diagram (*fig.* 32, 228) you will see that at the latter part of the period of ventricular rest, the auricle contracts smartly and dilates the ventricle, which latter immediately begins its systole. But there is another period manifested by the diagram. At the end of the ventricular systole, the auricle is most dilated. Suddenly an active dilatation or diastole of the ventricle takes place, and the blood from the distended auricle falls into it; hence this

obstruction-sound may occur just before or just after the first sound, and, in the last case, it would be identical with the second sound, which occurs, of course, at the moment the diastole begins.

284. The point of greatest sound for this murmur is over the left ventricle, i. e. (*fig.* 29, p. 96) between the third and fourth ribs, and two inches from the sternum.

285. *Impulse of the heart.* Irregular beating is almost always an accompaniment of an obstruction of the mitral valve, owing to the blood being unable to pass rapidly enough into the ventricle to distend it, before the systole commences. Hence the ventricle makes two or more small spasmodic contractions, and consequently impulses to the auscultator's ear, to one firm one, which occurs occasionally when the ventricle becomes full. This irregularity is usually perceptible at the radial pulse, but sometimes not so, and the pulse seems very slow, corresponding to the full beats of the heart, and not irregular. The amount of irregularity and inequality of force depends on the amount of disease (246, 251).

286. It is but right to state, however, that according to Hope,* the same kind of pulse may be found, in softening of the heart, great pericardial

* Hope on Diseases of the Heart, page 360.

effusion and polypi from endo-carditis. But in these cases there is, usually, no valvular murmur, and there are other signs diagnostic of each.

287. *Inspection, mensuration and palpation* give little results of importance, more than those revealed by auscultation.

288. The following case illustrates what has been stated. I have obtained it from Dr. Hope.*

“*Dilatation and softening of all the cavities : hypertrophy of the right ventricle ; attenuation of the left ; great contraction of the mitral valve ; fatal polypus.*—Mrs. L ——— consulted me Dec. 27, 1829. She had livid lips ; a defined purplish red on the cheeks : complexion elsewhere sallow ; dyspnœa and palpitation, excited even by walking across a room, and to excess by ascending a flight of stairs ; frequent cough, preventing sleep ; constant copious expectoration of frothy, viscous mucus, the temporary suppression of which, by sleep or opiates, caused paroxysms of excessive dyspnœa and orthopnœa ; chilliness, particularly of the extremities ; universal and extreme anasarca ; catamenia regular ; bowels open ; pulse small, weak, unequal, and intermittent ; urine scanty and high colored ; thirst ; anorexia.

* Hope on Diseases of the Heart, Pennock's edition, page 518.

Complaint commenced ten years before I saw her, and was attributed to difficult parturition. The symptoms were always greatly aggravated by "colds," to which she was particularly liable. She frequently had slight œdema pedum, which subsided spontaneously. Always felt best in a warm, humid atmosphere.

Auscultation.—*Impulse* imperceptible. *Sounds.* Both were short, flat, and audible so far as the right clavicle. They were weaker on the left side of the heart. Murmur was not noticed. By the usual diuretics and aperients, the dropsy was completely removed in six weeks, the strength being little impaired and the appetite good. She was then suddenly seized with oppressed palpitation, suffocative orthopnœa, constant nausea, and over-exhaustion, anxiety and jactitation. The dropsy began to re-accumulate, the sense of suffocation became agonizing, the pulse failed entirely for twenty-four hours before death, and she sank a week after the relapse.

Autopsy.—Pulmonary apoplexy and engorgement. *Heart* double the natural size, and very flaccid and pale. *Ventricles.* Right dilated to double; its parietes were not attenuated, and the column carneæ were hypertrophous. The left was less dilated, and its walls were reduced to one-third of an inch in thickness. *Auricles.* Right,

dilated; its parietes thin and diaphanous. Left, greatly dilated, considerably thickened, and almost completely filled with a polypus adhering firmly to its lining membrane. *Valves.* Aortic, slightly cartilaginous, but unimpeded. *Mitral*, contracted by cartilage into a *slit* which only admitted a writing quill. *Liver* slightly enlarged, granular, and of yellowish brown color.

Remarks.—This case is remarkable as presenting a degree of valvular contraction seldom if ever exceeded, and as showing with how great an amount of disease life may be prolonged for a series of years.”

REGURGITATION THROUGH THE MITRAL VALVES.

289. *Auscultation.* The most striking phenomenon in this disease is a bellows murmur, which may vary from the slightest breezy character up to the saw-mill sound, according to the kind of disease of the valve and to the amount of that disease. A very rugged and at the same time permanently open orifice is supposed to produce usually a rougher sound than when the valve is smoother but equally open (226). Hope speaks of it as resembling a distant whispered *who* (234).

290. This murmur is, of course, connected with the first sound, because it must occur during the

systole of the ventricle (*fig. 32, 228*). It may be so loud and long as to obscure the second sound; but this is not usual. It is heard most distinctly between the third and sixth ribs (*fig. 29*) over the left ventricle. It radiates from the spot corresponding to the valve, and is heard only slightly along the carotid. Hence arises a means of diagnosis between this and disease of the aortic valves, the sounds from the latter passing along the carotids and aorta, so that they are heard over a larger space than these of which we are now treating (*227*). This sound may be caused by anything that causes any degree of patency of the valve, for example, anything that contracts the chordæ tendineæ; by atrophy of the valves; by adhesions of do.; by their dilatation in consequence of dilatation of ventricle; finally, mental excitement may cause undue action of the organ, and a momentary regurgitation may occur (*220, 225*).

291. *Percussion* gives no characteristic signs.

292. *Inspection, palpation and mensuration* afford no *certain* signs of this disease, though palpation indicates at times an increased impulse of the heart, from hypertrophy, which frequently, though not necessarily, accompanies the disease. An irregular or *dicrotic* impulse at the heart, at the carotid and radial arteries (*251*); with the

purring tremor in the cardiac region (206) is likewise very common.

293. The following case illustrates the above remarks.

T. aged 13, of a feeble constitution, and having suffered with chronic disease of the heart, entered the Mass. General Hospital, April 1, 1845. He was delirious and had been so for a week or more. He died six days after entrance, of tubercular meningitis. The physical signs relating to the heart, were a strong impulse over the ventricles, with a bellows murmur over the same, and connected with the first sound, while the second sound was normal. At the autopsy, the aortic and pulmonary artery valves were normal, and held water most perfectly. The water passed freely through the mitral valve. It was thickened, opaque, hardened, and contracted, as were likewise the chordæ tendineæ and columnæ carneæ attached to it. In other words, there was exactly enough of disease to seriously obstruct the action of the valve, and allow the blood to be thrown back into the auricle with each ventricular systole. The heart was normal.

OBSTRUCTION OF TRICUSPID VALVE.



s the same physical conditions exist in this case as in obstruction of the mitral valve, you may refer to the description of that (283). But you must bear in mind these facts First, it is very rare that disease of the tricuspid exists alone. I do not remember of ever seeing but one case, and, in that, the disease was very slight. Second, owing to there being usually very slight disease, the valves are rarely obstructed in their operation.* Their murmurs resemble the “*who*” of the mitral valve (289).

295. For the spot at which the morbid sounds resulting from it will be heard most distinctly, you may refer to diagram (*fig. 29*, p. 96) and see that it will be about the junction of the fourth and fifth ribs with the right of the sternum, and extending up diagonally along the sternum.

REGURGITATION THROUGH THE TRICUSPID VALVE.

296. This, as a morbid change, is almost never found (Hope).† I refer to the last article for the

* Hope on Diseases of the Heart, page 104.


† Ibid., p. 105. Pennock, however, says it is heard not unfrequently.

parts at which you shall auscult ; and also to the article on regurgitation through the mitral valve, for the principles on which the sounds are produced (289). It is liable to produce a pulsation of the jugulars, owing to the blood from the ventricles being thrown back into the veins with each contraction of the ventricles (255).



OBSTRUCTION OF THE AORTIC VALVES.

AUSCULTATION.

OME obstruction of these valves is very common, and a bellows murmur of any variety may be heard in consequence thereof. It may simply prolong the first sound (223), or it may mask it by a sawing or rasping character (223). It is usually heard most distinctly over the aortic valves, and thence radiates, being less distinct as you go farther from the valve. It is transmitted very strongly along the carotids, and less distinctly down the back, along the aorta (229). Hence one diagnostic sign between this and diseases of the mitral valve (227). It occurs during the sys-

tole of the ventricle. It is generally very superficial, and sounds like a whispered "r" or "s." The *impulse* is usually augmented (245), owing to hypertrophy of the ventricle (275) from the obstruction to the proper performance of its duty of sending the blood over the body. Very commonly there is an irregularity in the beats, owing to the ventricle being obliged to make one or more contractions to overcome that obstruction (246).

298. *Palpation*. At times, there is a thrill (206), as the purring sensation, but this may happen in any disease of the heart where there is a great obstruction. The pulse, at the wrist, will be small if there is great obstruction, though the impulse at the cardiac region be very strong.

299. *Percussion*. Generally dullness over a larger space owing to a distention of the heart or hypertrophy. This, of course, ordinarily supposes a chronic disease. There may exist no abnormal dullness.

300. *Inspection* gives no results.

301. For an example of this combined with regurgitation or diastolic sounds, see (306).

REGURGITATION THROUGH THE AORTIC VALVE.

302. *Auscultation*. The blood, not being retained by the semilunar valves, returns during the diastole of the ventricle. Of course it immediately

follows after the second sound. A slight musical murmur or bellows sound would be thus produced, either immediately following or masking the second sound. It would be heard over the aortic valves (*fig.* 29), less, down along the ventricle. It is generally slighter than the sound from obstruction, and sounds like a whispered “*awe*” (234).

303. *Inspection* teaches but little unless hypertrophy exists. The *impulse* may be somewhat irregular, and, at times, a back-stroke is perceived, and the pulse is jerking (246, 275).

304. *Percussion* and *mensuration* reveal nothing.

305. *Palpation* may give a thrill (14, 206).

306. EXAMPLE. The following taken from Hope * will afford examples of the sounds usually heard in the three conditions of the valves commonly found in diseases of the heart, viz. : disease causing, first, regurgitation through the mitral valve (289); second, obstruction of the aortic valve (297); and, third, regurgitation through the same (302).

V. aged 50, had a weak, irregular, unequal and small pulse. For three years he had been short winded. Impulse, natural (showing no hypertrophy), (205). A musical note, loud, sounding

* Hope on Diseases of the Heart, page 527.

close under the ear, an inch below, and a little to the sternal side of the left nipple, accompanied the first sound of the heart (289). (The position, viz.: over the mitral valve; the time, viz.: during the systole, or with first sound, and finally its diminution on ascending the ventricle; all these indicated the mitral valve to be its seat, and that the orifice was *insufficiently* closed). On ascending higher, a musical note, still with the first sound, became again audible, and became perfectly distinct over the aortic valves (297); then two inches along the aorta where it seemed more superficial than at the valves themselves (334). This musical note was mixed with a common murmur, which was also heard along the aorta. Both sounds were very indistinct along the pulmonary artery. (The musical note still accompanying the first sound, and heard over the aorta, indicated *obstruction* of the semilunar valves of the aorta, while the sound becoming more superficial, above the aorta, might lead to the suspicion that there was some roughness of that vessel). The second sound over the aortic valves was *tailed* by a feeble though distinct blowing like a whispered "*awe*" (234), which decreased on going down over the ventricle, and was prolonged to the ensuing ventricular systole. (The time, viz.: that of the second sound, and immediately connected with it, the place at which

this was heard, viz. : over the aorta, indicated regurgitation, during the whole period of the rest of the heart, through the semilunar valves of the aorta) (302, 231).



OBSTRUCTION OF PULMONARY ARTERY VALVE.

DISEASE of this valve is a very rare circumstance. Consequently, a marked sound connected with it is very uncommon. In fact, I should rarely have suspicion of any disease existing in the pulmonary artery without some affection of the aorta, for such a state of things is almost never seen. There are some malformations of this part, but in these cases, the trouble is congenital. I do not absolutely deny the existence of disease of this artery solely, but I mean to say that it is very rare and that I have never seen a case.

308. Still there *may* be some disease of it, and therefore it is proper to know that, by following the rules laid down for auscultation of the aortic orifice, but changing your place of examination to the left breast, *off* from the sternum instead of

on it, you may generally come to some conclusion (*fig. 29, 213*). Another fact should be borne in mind. Usually the clapping sound of the healthy pulmonary artery valves will be heard, even when there is serious aortic disease, with loud and very marked sounds consequent thereupon. If, therefore, in a case of serious disease of the heart, with very morbid sounds, you discover that this second sound is wanting, you may *suspect* disease of that valve. But you must not be sure of it, for a loud bellows murmur or irregularity of the sounds and motion of the heart may obscure the sound of the healthy pulmonary artery valve.

REGURGITATION THROUGH THE PULMONARY ARTERY.

309. This likewise is very rare. I have never seen a case. The sounds, of course, would be less than over the aorta and to the left of it (*fig. 29, 213*).

EXAMPLE OF DISEASE OF THE PULMONARY ARTERY.

310. The following case is very interesting and instructive. I quote from Pennock's edition of Dr. Hope's work. *

* Hope on Diseases of the Heart, page 531.

S. W. aged 36, yellowish complexion ; short winded for ten years, owing, she thinks, to striking the chest against a post. Dyspnœa on entrance ; pain in scrobiculus cordis ; ascites, œdema. Pulse seventy, large, full, rather tense. Great dullness over the heart, prominence, pulsation and purring sensation between the cartilages of the second and third left ribs. (The last point was immediately over the place of the pulmonary artery). *Impulse* of the heart, much more extensive and considerably stronger than natural, particularly in the left præcordial region. Pulsation, felt in epigastrium. *Sounds* of the heart. The first was an extremely loud, harsh and superficial sawing sound, extensively audible, and most so over the prominence of the second and third ribs. (The place of the sounds indicated the pulmonary artery as the most probable seat of disease). *Diagnosis* by Dr. Hope. Hypertrophy and still more dilatation of the heart, greatest on the left side. Dilatation of the origin of the aorta, probably forming an aneurismal pouch towards the left. At the autopsy the facts were as follows : Hypertrophy and dilatation of the heart, *aorta* contracted ; *pulmonary artery* dilated to a circumference of four inches and a half.

PALPITATIONS IN DYSPEPSIA, ETC.

PALPITATION is a very common symptom in old dyspeptics, and in students. In these cases there are usually no severe rational signs; the dyspnœa and palpitations being the only marked ones. There are no physical signs, or they are but a slight prolongation of the sound; and sometimes increased impulse, at the first part of the examination, which subsides in a short time. These negative signs may, at times, become of great importance. Not unfrequently, in purely dyspeptic cases, especially in females, you may hear in the jugulars the *bruit de diable* (257). I should consider this a favorable omen; because it is very rarely, if ever, heard in organic diseases of the heart or large vessels.

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GENERAL REMARKS ON VALVULAR DISEASES.

REMARKS AND CAUTIONS ON VALVULAR DIAGNOSIS.

By considering what we now know of diseases of the heart, and the comparative accuracy of our diagnoses in all these complaints, with what the medical profession knew before Laennec arose, the difference is seen to be immense. The following are some of the important advantages gained by auscultation.

First. *Pericarditis* was never definitely recognised before death. Since Laennec, Louis, Bouillaud, and others have written, it has become an easy thing to recognise it even in its earliest stages (258).

Second. The common rational signs only of diseases of the substance of the organ were known; of course, therefore, none but the most general and indefinite results could be obtained. This must be evident even to the greatest sceptic in regard to the usefulness of auscultation.

Third. Formerly, the recognition of the differ-

ences between organic and functional diseases was at times very difficult, if not impossible.

Fourth. Scarcely a quarter of a century has elapsed since the time when the slightest approach to a decision of the particular valve that was diseased was never thought of. Thanks to the followers of Laennec ; Bouillaud, Hope, Louis, Williams, Graves, Stokes and others ; we now can attempt to solve all these problems, and, in the majority of cases, may, with a due degree of care and by carefully weighing the relative value of the various physical and rational signs, come to an accurate decision.

313. Then why should we complain, if, in some cases, we cannot determine the peculiar structural disease that may exist ? That such is the fact, that mistakes are not unfrequently made by the best auscultators, I know from having seen these errors committed, and from the writings of others.*

314. Still further ; ought we to complain if, at times, even good auscultators decide that a case is one of organic disease, when, in fact, the heart is

* Messrs. Graves and Stokes, a few years ago, published their manifesto of unbelief in the accuracy of some of the rules of diagnosis, from the physical signs alone in diseases of the heart. See Hope's case (310).

perfectly healthy, but interrupted in its action by the influence of adjacent organs? *

315. I would, therefore, make the following remarks, as warnings to the young auscultator.

First. Be careful about inferring *too much* from physical signs *alone*.

Second. Do not risk your reputation by too nice a diagnosis.

Third. If you make an error, comfort yourself with the belief, that, perhaps, part of the difficulty lies inherent in the subject, and not wholly in your blundering ear and judgment.

Fourth. If you make many errors, still be hopeful, at thinking how much more clear-sighted you are than those who have gone before you. Believe that auscultation teaches very much although it may be imperfect. Learn humility; but do not despair of becoming more accurate in future.

Fifth. Above all, do not, from the *physical signs alone*, imagine that you have found out a severe organic disease of the heart, when perhaps, nothing but a functional derangement really exists, that will mock your fatal prognosis.

* See New York Journal of Medicine and Surgery; article by Dr. Sweet, in which notice is taken of a severe form of bellows murmur, in consequence of the heart being pushed out of place by an abdominal tumor.

316. *Example* of my method of examining a man who appears, on inquiry, to have the symptoms of chronic disease of the heart, viz.: palpitation, dyspnœa, perhaps orthopnœa, dropsy, &c.

If possible, I examine the patient in the erect and recumbent posture. I remember particularly the rules already given (1, 202).

Inspection. I remove all the clothing from the chest and neck, and I observe if there is any evident pulsation about the cardiac region, and, if there be any, whether it is over a large space (245); whether it is rolling and irregular; whether it is out of the right place, between the fifth and sixth left ribs (205); whether there is any local pulsation over the aorta; or any unusual prominence over the heart (262); (remembering, however, on this last point, that a slight prominence may exist, without any disease of the heart; owing to a want of symmetry in the two sides of the thorax (6)). Passing my eye upwards, I observe whether there is any pulsation of the jugulars or prominent distention of them (255); whether there is any unusual fulness about the neck generally. If any one of these signs exist I *suspect* organic disease. If all of them occur I am nearly certain of that fact. The differential diagnosis, as it is called, of the particular disease, I refer to a later stage of the examination. I then proceed to,

317 *Palpation*. If I find a full heaving impulse (205); especially, if it be irregular, or connected with the purring thrill (206); if the head of the auscultator is raised with every action of the heart, if there is a back-stroke (275), or an irregular jogging motion (246); if these or any of them are felt, my suspicions are confirmed that serious disease of the heart exists. If there is a thrill over the aorta (251), I should fear disease there as well as in the heart.

318. *Mensuration* may be of importance in giving exactly the arc of the prominence of the chest, but I never make use of it. Inspection is far better for me (262).

319. *Percussion*. I rely very much on this, for by it I learn the *size* of the heart. If there is greater dullness than usual over the heart, especially if it extend outside of the nipple and beyond the right side of the sternum, I fear hypertrophy (275), dilatation (277) or pericarditis (260); the first usually, in a chronic disease, and I decide between these diseases by the examination of the other signs.

320. Finally; I *auscult*, first, with my ear to get a general idea of the sounds; but, in order to distinctly localize the various sounds, the stethoscope is absolutely necessary. Dr. Hope advises us always during auscultation, to keep the hand

on the pulse. I frequently find it important to do so.

321. If, under these circumstances, with inspection, palpation, and percussion favoring the idea of severe disease of the heart, I hear first a modification of the first sound, whether as a simple soft prolongation of it, or the severest rasping sound (223); second, if, moreover, this sound is most distinct over the sternum about the second rib, and it extends up the carotids, and is less distinct below over the ventricles of the heart; third, if this occur at the time of a strong systole, I infer that the aorta is *obstructed* (297), and that probably the heart is larger than usual.

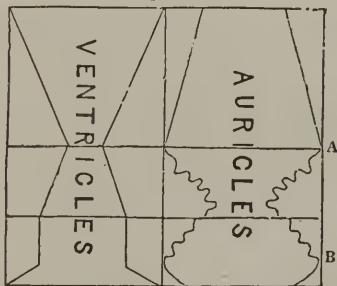
322. If, on the contrary, the same modification of sound be heard after the second sound as a tail to it, as it were, I should think, that the heart was enlarged and diseased with aortic insufficiency and *regurgitation* (302).

323. Again; suppose the sound is heard lower down and towards the left nipple, and not so distinctly heard, or perhaps not at all heard along the carotids; suppose it still exists during the systole of the ventricle and with the radial pulse, I should infer that the mitral valve allowed the blood to be thrown back into the left auricle, or, in other words, there was *insufficiency* of the mitral valves

324. Finally, if the sound is very slight and in the same place, if it immediately precede either the systole or diastole, I should suppose some *obstruction* to the *mitral valve* (283); for, in that case, the auricular contractions, at the end of the period of rest, would cause a slight murmur on attempting to force its blood into the ventricle before the systole of this last.

325. A similar sound might be heard when the flood falls from the highly distended auricle into the ventricle at the beginning of the diastole of this last (233). To make this more evident let us refer to our diagram already used (*fig. 30, 214*; and *fig. 32, 228*).

Fig. 33.



It is evident, I think, that at the points of time, A B, a fluid is rushing with impetuosity from the auricle into the ventricle, and, of course, some sound must be produced. This sound, in both

cases, is always slight ; it is sometimes imperceptible ; it is strongest at B, because there the auricle contracts and *forces* the fluid onward, whereas in the other case it is simply a *falling* of the fluid from the auricle into the ventricle (233).

325 a. Similar remarks might be made in regard to the pulmonary artery and tricuspid valves. The places, in which the sounds would be heard, would be changed. Those of the former would be transmitted up the carotids less than murmurs from the aorta ; and sounds from the tricuspid would be perceived strongest under the sternum (*fig.* 29, 213).

326. If instead of only one of these sounds I hear several, as for instance, the sounds of mitral regurgitation and of aortic obstruction and regurgitation, the only inference I make is, that *both* of these valves are diseased instead of one. It must be confessed that sometimes it is impossible to distinctly localize the sounds. In such a case I think it scarcely worth the trouble to attempt to do so, inasmuch as I can at least be certain that I shall have to deal with serious valvular disease, and in this case I settle by percussion, or auscultatory percussion (389) the exact size of the heart.

327. But, finally, supposing that the rational signs have led me to believe in the existence of organic disease, and I find on inspection and pal-

pation some abnormal impulse, but no increased dullness on percussion, and no morbid sound on auscultation; of course the physical signs become the sheet-anchor of faith for myself and my patient, and I tell him he has no *severe* disease. Some may say I may be deceived. Very true, but the risk of being so is infinitely small, whereas if I express a doubt to my patient I make him miserable and do myself no good. I am satisfied that the number of cases in which such a declaration would be correct are not a few.

MALFORMATIONS OF THE HEART.

IF you remember that these are congenital and that no hope can be entertained of doing any good by treatment, you see that it is of little practical importance to attend to the physical signs. They vary in every possible manner. Usually the bellows sound is the most common, with irregularity in the rhythm (223, 219).

SIGNS OF MALPOSITION OF THE HEART.



ALPOSITIONS of the heart may be congenital, or the result of disease. The congenital are those in which most of the organs of the body are exactly reversed in their position.

The heart lies in the right chest, the liver in the left hypochondrium; the arteria innominata is given off to the left, &c.

Inspection shows the apex of the heart beating to the right of the sternum.

Palpation may give the same.

Auscultation and *percussion* prove the same; the sounds being heard at the right side of the sternum, perfectly normal, and the *percussion* gives dull sounds on the right breast, while the left is clear.

MALPOSITION FROM DISEASE.

330. Pleurisy, pneumothorax, organic diseases of the lung or abdomen may thrust the heart wholly out of its usual position; either far up towards the clavicle, as in distention of the abdomen, or to

the right side, as in case of pleurisy of the left side. So, too, pleurisy, &c. of the right side, may push the organ to the left beyond the nipple. Pneumothorax will do the same, &c. (167, 140).

331. *Inspection, palpation* and *percussion* will easily indicate this change, but

332. *Auscultation* may mislead you. The obstruction caused to the heart by thus being thrust out of place, produces, at times, a bellows murmur which may, by its rasping character, simulate severe valvular disease. Be careful of inferring anything from these sounds when there is any great change from the normal position of the heart (314).



SIGNS OF POLYPI OF THE HEART.

THAT we can sometimes *suspect* the existence of polypi or coagula in the heart, I am not disposed absolutely to deny; but the cases in which we can make this diagnosis, generally occur when patients are in articulo mortis, or so

near death that we can do nothing for their relief. The symptoms are an obscurity of the sounds of the heart, and a bellows murmur ; and usually some irregularity of motion (223, 219).

DISEASES OF THE ARTERIES.

ROUGHNESS OF THE ARCH OF AORTA.



ROUGHNESS, simply, without other serious lesion of the aorta, I do not consider an affection worth much notice. In connection with various diseases of the heart it becomes of some importance, from its producing a roughened, quite superficial bellows murmur, just at the upper part of the sternum (223). This sound, it is difficult to distinguish from an obstruction-sound of the aortic valves (297). It is but just, however, to say that one able writer (Dr. Graves) has given the report of a case in which there was great roughness of the aorta, but no morbid sound was heard along the aorta, but, on the contrary, a loud sound appeared over the ventricle (227).

SIGNS OF ANEURISM OF ARCH OF AORTA.



BEFORE the arch is so dilated as to cause some absorption of the upper part of the sternum and some prominence thereof, simple *inspection* teaches nothing. When a tumor appears, it is superficial perhaps, though distinctly seen to be pulsating by the eye of the observer. Gradually, it may project three or four inches from the level of the sternum (*fig. 34, 344*), and in this case the pulsations become still more evident (249).

336. *Palpation*. Not unfrequently we can feel an impulse and likewise a purring thrill before the tumor is very manifest to the eyesight. Simple impulse, however, is not a proof of aneurism, because there may be a tumor pressing on the aorta, which last may be normal (250, 251).

337. *Mensuration* is of little importance, for inspection is much better and supersedes it. It may be sometimes needed (252, 344).

338. *Auscultation*. Sometimes you may hear no sound or have no sign from auscultation.

For example. A very small aneurism of the

arch, which does not compress any important part, may remain latent to auscultation.

339. But suppose it is larger, or of the same size, but so situated as to compress one of the primary bronchi. In this case you may, with obscure rational signs of disease of the circulatory organs, find decided diminution of vesicular murmur throughout the whole of one lung. One primary air-tube may be compressed and will then allow, perhaps, only half its usual quantity of air to enter. In this case, likewise, you may hear some bellows murmur (28, 223).

340. As the disease augments, a simple, clear sound, or, more commonly, a bellows murmur, sometimes very distinct, like a saw-mill sound, may be heard towards the upper part of the sternum, or behind, along the vertebræ, on a level with the spine of the scapula (253). This may become very rough in its character. Formerly, this buzz was considered *pathognomonic* of the swift rushing of blood through an aneurism. It merely suggests an aneurism, but can never prove it.

341. Still further ; if the disease form a tumor so large as to compress and push aside a portion of the lung, there will be an entire absence of the respiratory murmur to some extent on both sides of the median line of the sternum (28, 41). Generally, however, this phenomenon does not

occur unless other signs, such as prominence of the part (204), the purring thrill, &c. accompany it (206). Of itself, it would not be pathognomonic of aneurism, for though it should certainly lead us to suspect aneurism of the arch of the aorta, still it might be produced by any tumor lying directly over the aorta (348 a).

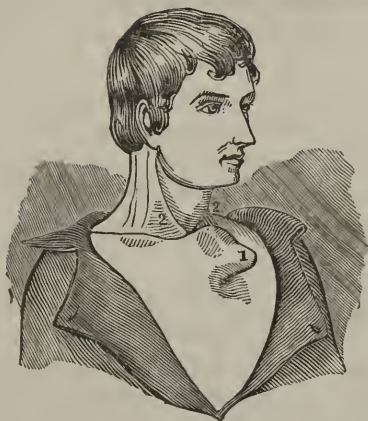
342. Finally, when the disease projects as in the profile plate given below (*fig.* 34, 344), if the tumor has the thrilling feel (14, 206, 251); if it pulsates (251); and is flat on percussion (101); if the circulation is troubled, especially, if, combined with these, we find the pulse in one wrist less than in the other, we may feel very certain that there is aortic aneurism (348 a).

343. *Percussion.* Of course this indicates nothing until the tumor is of some size, and it is then merely corroborative of other signs. When the tumor augments so as to compress the parts underneath, even if it does not wholly reach the sternum, you may get a *change of note* over the part (99). When it is very large, especially if it cause any prominence, you will find complete dullness (101). The diagnosis between this and a malignant or other tumor over the arch may possibly be gained by auscultatory percussion (390), but I have no experience in that matter.

344. EXAMPLE OF ANEURISM OF THE AORTA.

A. M., porter in a large wholesale warehouse, aged 44, entered the Infirmary for Diseases of the Lungs, Nov. 20, 1839. He was a patient of Dr. Perry's. The account he gave of himself was as follows: Health, in early life, good; seven years before consulting us he had had dyspnœa and cough without expectoration, and with these symptoms he had occasionally suffered from that period. At his entrance, there was soreness in the cardiac region and pain shooting to the left shoulder and left arm; hoarseness; constant dyspnœa, and the cough was increased with some expectoration. The other functions were well. On examination by *inspection*, a tumor (249) was seen, bounded above by the clavicle and the upper part of the sternum; at the left, by a line let fall from the clavicle an inch from the sternum; below, by the cartilages of the third rib, and at the right, by a line drawn from the middle of the sternum. The tumor was circular and raised one quarter of an inch above the surrounding parts. On *percussion*, the sound was normal every where on the chest except over the tumor where it was flat (101). On *palpation*, a purring sensation was perceived over the tumor (251). On *auscultation*, the respiration was well every where, except that it was more distinct on the right back than on the left

(339), and that over the tumor it was bronchial or nearly tracheal (41). The sounds of the heart were heard slightly over the cardiac region (215), but on ascending the tumor they became, especially the second, much more manifest. No bellows murmur (223, 253). Some sonorous râles were heard on the back (62). The tumor continued to augment till the patient died. The investing skin became very thin, so that for months it seemed as if it would break. In November, 1841, it projected as represented in the plate (*fig. 34*) *beyond* the line of the chin. It made so formidable a tumor and interfered with his labor so much, and was so liable to be injured, that, for a time, he wore a metallic shield over it. It was nine and a half inches in circumference and projected about one and a half inches above the level of the sternum. The sterno-mastoid muscles were raised upon it, and all the muscles of the neck were very much developed. The accompanying plate represents his appearance at that time. 1 is the tip of the tumor, very thin and somewhat discolored, dark. 2 2, are the sterno-mastoid muscles raised upon the tumor.


Fig. 34.

The last time he visited the Infirmary (June 22, 1842), its apex was three inches beyond the level of the sternum, and had a purplish aspect, and the pulsation could be seen at a great distance from him. In August, 1842, he went to the close-stool and the aneurism burst. Having been always of a most cool temperament, he firmly thrust his handkerchief into the aperture, where it remained until he died, three days afterwards. At

the autopsy, an immense aneurism of the arch of the aorta was found pressing forward and causing absorption of the sternum, and likewise backwards, producing absorption of the bodies of several of the dorsal vertebræ.



ANEURISM OF OTHER PARTS OF AORTA.

IGNS like those mentioned in the preceding section, may be present in aneurisms of the *thoracic aorta*. The physical signs, however, would be more manifest at the posterior part of the chest than they would be in front. There is a diminution of the respiration on one side of the vertebræ (339), and prominence of the ribs at their junction with the same (335), the aneurismal buzz (340), dullness on percussion (343).

346. In *abdominal aneurism* there may be prominence, &c. in the loins. This, combined with rational symptoms, may lead us to a diagnosis, but we must be very careful in ausculting in front, through the parietes of the abdomen, not to

lay much stress upon any amount of bellows murmur that may be heard, for the pressure of the stethoscope on the aorta is apt to produce it. For the signs, see those of aortic aneurism (335 to 343).

ANEURISM OF THE SUBCLAVIAN.

347. For the signs you may have the tumor, the pulsation (251), the purring thrill (14), the bellows murmur (223), as in aortic aneurism (335 to 343), but the prominence is less and about the clavicle.

ANEURISM OF OTHER ARTERIES OF THE BODY.

348. For signs, see aneurism of the arch of the aorta (335 to 343). The tumor will, of course, be in the part corresponding to the diseased artery. In the extremities, palpation will be of more service than anything else. But this comes under the province of surgery more than of medicine.

TUMORS OVER ARTERIES, SIMULATING ANEURISMS.

348 *a*. At times, you may be in doubt upon this subject, for you may feel a pulsating tumor (251), hear a bellows murmur (223), and find flatness on percussion, &c. (101), as in aneurism. Ordinarily, the diagnosis will not be difficult, if we compare

the rational signs with the physical, and these latter with each other. The pulse will assist very much in aortic aneurisms; as aneurism of this tube frequently interferes with the arteria innominata or the left subclavian, and, consequently, with one or both of the radials, &c., according as it encroaches upon and checks the current of blood sent towards the origin of the former vessels.

348 *b.* For instance, aneurism of the aorta frequently causes a difference in the pulse in the two radials or carotids. It might have a similar effect on the femoral arteries. A tumor would be less likely to produce this effect. Aneurism along the course of the carotids, brachial or femoral will also present difficulties. A tumor of the thyroid gland will, at times, protrude to one side, and will appear to pulsate, giving the appearance of disease of the carotid underneath. By making the patient swallow, we see these tumors rise and fall with each act of deglutition, showing it to be evidently a disease attached to the trachea, and not an aneurism of the carotids. In like manner, pulsating tumors will be found in the legs. Frequently, we can, by deep pressure, separate the tumor from its bed and raise it a little from the subjacent artery, and the pulsation is relieved. Notwithstanding all these remarks the diagnosis is at times somewhat difficult, and requires all the *tact* of the most experienced surgeon.

OBSTETRIC AUSCULTATION.

OBSTETRIC AUSCULTATION.



IN the course of my midwifery practice I have frequently ausculted women when in labor, and have heard all the sounds that will be hereafter mentioned. I have made use of them to satisfy myself of the death or life, and the position of the fœtus. But I have rarely ausculted in the earlier months of pregnancy. So that most of the remarks that I shall make in regard to *these periods* I shall quote from others.*

350. You may use your ear or a stethoscope, according as you may be accustomed to use one

* Cyclopædia of Practical Medicine, "Signs of Pregnancy," by W. F. Montgomery, M. D.; Observations on Obstetric Auscultation, by Every Kennedy, New York, 1843; Andral's Edition of Laennec, Paris, 1837.

or the other in examinations of the chest. You may hear better with your ear, but you would do well to auscult, at times, with the stethoscope, as in some cases you may need it. You must have the room very quiet, more so than in pectoral examinations. You will press your ear on the abdomen, firmly, but not in such a manner as to disturb your own powers of hearing. Let the patient be lying on her back in bed, and with a single covering; not that this position is absolutely necessary, but it is the best one (19, 1).

351. There are two auscultatory phenomena which are of service in the practice of midwifery, viz.: the placental murmur (*bruit placentaire*) and the sounds of the fœtal heart.



PLACENTAL MURMURS.



As early as the fourth month, or perhaps earlier (see below), that is, before quickening, and when the uterus is just rising out of the pelvis, you may perceive, if you have a sharp sense of hearing, a sound resembling the bellows

murmur of Laennec. Now this varies, as in the chest, from the slightest breezy murmur up to the most violent sawing sound (223). At times, like that of the chest, it becomes softly cooing, droning, or musical (224).

353. It is *not constant*; that is, either from change of posture of the womb, or from its contraction, as during labor, and perhaps from other causes, it sometimes ceases to be heard.

354. But when heard, it is always in the *same place*, unless indeed during the intervals between the two examinations, the womb has enlarged.


355. Some say that this sound is owing to the passage of blood in the uterine vessels connected with the placenta, and of course ceases when these vessels have ceased to be pervious.

356. It usually ceases the moment the placenta is thrown off. It may, however, continue a very short time afterwards, owing apparently to the vessels of the uterine placenta being still pervious, and the womb uncontracted. It may continue a little while after the death of the fœtus. It alternates and corresponds with the mother's pulse. It is heard most distinctly over the spot corresponding to the attachment of the placenta, most frequently on the right side.*

* Dr. Montgomery, Cyclopædia of Practical Medicine.

357. Some doubt appears to exist as to the *earliest period at which this sound can be heard*. Drs. Kennedy and Irvine record cases in which as early as the tenth week after conception, they *suspected* pregnancy, (and would not declare the patients to be in the contrary condition, which, under the circumstances, was a very desirable object), simply from *repeatedly* hearing, on two or three successive days, a *souffle* just over the pubes. Dr. Montgomery has never heard it until the fourth month has been completed, although he has frequently endeavored to hear it earlier. Dr. Kennedy discovers it before any uterine tumor can be observed.

SOUNDS OF THE FŒTAL HEART.

URING labor, the sounds of the fœtal heart can be heard usually without difficulty. The sounds remind one of the distant ticking of a watch, and it is a good practice for you to enclose a patent lever watch in a handkerchief, and hold it at such a distance from the ear that you can just perceive the ticking. Imagine that tick-

ing to be twice as quick as the adult pulse, so as to be one hundred and twenty or thirty instead of sixty or seventy times per minute, and you will have a very fair idea of the fœtal pulsation.

359. Usually, this frequency distinguishes the fœtal heart from the mother's circulation. Yet it may be very much altered, quickened or weakened, &c. by the various conditions of the parent. Mental emotions, joy or sorrow, hæmorrhage, &c. produce changes, though no general rule can be laid down in regard to the amount or character of these changes. But they may become of vital importance to the child under certain circumstances, and it is well for you to study the pulsations in every case with reference to this point. The following case shows the excellent results of a wise auscultation.

360. EXAMPLE. A physician was in attendance on a woman in labor. He had heard the fœtal heart several times, and it seemed perfectly normal. Suddenly, the patient began to appear somewhat languid, and showed other, though indistinct signs of depression of strength, and on auscultation he found that the heart of the fœtus had ceased to beat. He inferred that there was internal hæmorrhage, and that the child was dying or dead in consequence thereof. He immediately turned

and delivered by the feet. The child was still-born; the placenta was found detached, and internal hæmorrhage, as he anticipated, had taken place. By the use of artificial respiration the child was restored. In this case, the fœtus would probably have died, if the physician had not been acquainted with obstetric auscultation.

361. Sometimes, the sounds have a metallic character like the *metallic tinkling* in pneumothorax. From its being heard always in the right iliac region, Dr. Kennedy suggests, with truth, as I believe, that it is owing to the transmission of the sound through a distended cavity with thin walls like the cœcum (66).

362. The *extent* over which you will hear the fœtal sounds varies much. You can always decide, however, on the spot whence it radiates. It, of course, is heard low down on the abdomen, at the earliest period at which the sound can be heard, viz.: about the fourth month or somewhat later. Immediately over Poupart's ligament, on either side, you will perceive it in its greatest distinctness. As the uterus augments, it will be heard a little higher, but it is rarely if ever heard *most distinctly* above the line of the umbilicus. In breech presentations the sounds are higher up than in presentations of the head.

363. The *earliest time* at which the fœtal heart

is heard is somewhat doubtful. Dr. Fisher of this city has heard it about the fourth month or a little later. Dr. Kennedy, likewise, has heard it at the sixteenth week,* but commonly four and a half or five months, or after quickening, has been the earliest period (352). When ausculting thus early we need a delicate ear and much perseverance. After the fifth month it continues to become more and more evident.

364. Is *absence of sound* a proof of no pregnancy? No; because the child may be dead, or the position may be altered for a time.

365. Among the *obstacles to obstetric auscultation* may be mentioned borborygmi, which sometimes are so loud and constant that they confuse young auscultators. A nervous female may have such spasmodic movements of the abdominal parietes as to interfere sadly with the operation. Tumors lying on the aorta or its branches, may cause a bellows murmur that simulating the placental souffle will confuse us. A change of posture may relieve the pressure and remove the sound. At times, it is said, the respiratory murmur of the mother, especially if attended with sonorous râles (62), obscures delicate fœtal sounds. In these cases we should make the patient cease breathing for a

* Obstetric Auscultation, page 61.

time. The auscultator's head if not placed carefully may deceive him, by allowing the pulsations from his own temporal arteries to be transmitted. In cases of hydatids a sound like chirping or gurgling is at times heard, in consequence of the motion of the hydatids upon each other.*

USE OF AUSCULTATION IN LABOR.

By auscultation we may possibly have one more means for deciding the position of the fœtus. The fœtal heart, being heard, for instance, low down towards the right of Poupart's ligament, we may suspect that the back of the head presents to the pubes, and if heard towards the back we might suspect it to be an opposite position, with the face to the pubes. If heard high up, we might, on the contrary, suspect a breech presentation. But this is of little importance, because the results are much less definite than in some other cases.

* I am indebted to Mr. Kennedy, *Obstetric Auscultation*, p. 346, for most of the remarks in this section.

367. Suppose the question is on the application of the forceps or the perforator. If the child is dead we need not fear the perforator; if otherwise, we might not try it. Now, the only *sure* sign of death is a constant, long continued, absence of the sound of the fœtal heart. Again, sometimes, a woman feels certain that the child is dead. She has felt no motion for many hours. The auscultator may assure her of her mistake, if he hears the fœtal heart, and new hope is thereby instilled into the sufferer's heart. Hence it becomes right for every practitioner to auscult his patient several times during labor, and any one who neglects this fails in the performance of his obvious duty. For an exceedingly interesting case illustrating the use of obstetric auscultation, see above (360).



DIAGNOSIS OF PREGNANCY FROM TUMORS, ETC.

THE diagnosis, by means of auscultation, of pregnancy from dropsy of abdomen or tumors of the uterus, &c. will, I trust, hereafter prevent any practitioner from plunging a trocar

into a pregnant woman, on the vain supposition of her being affected with ascites ! Tympanitis, too, may make women suspect themselves to be pregnant, and though the stethoscope may destroy the hopes of the patient, still your stern duty as an auscultator will require the destruction of all such fanciful maternal hopes. That such cases do occur the following will prove.*

(368 *a*). “ Mrs. —, of a full habit, desired me to give her my opinion whether she was pregnant. She has been married for two years, but has had no family. Her abdomen has been gradually increasing in size for the last nine months, and appears now sufficiently distended for a woman at the full period of pregnancy. Her menstrual discharge is irregular, and the breasts much swollen and tense. States, that she quickened some months ago, when she fainted, and shortly afterwards observed the motions of a child, which she has frequently felt since : has even experienced considerable uneasiness, particularly at night, from them. Some weeks since, she had the opinion of a medical gentleman of some eminence, who, on her expressing doubts of her being pregnant, told her, ‘ Madam, you are just as surely pregnant as that I am not.’ Since then, she consulted Dr. Collins,

* Kennedy on Obstetric Auscultation, page 182.


who expressed a very contrary opinion, and gave her to understand, that her swelling and other appearances of pregnancy depended upon *wind*. With these conflicting opinions pressing on her mind, she subsequently called on me to pronounce as to her state; at the same time informing me, that whatever opinion might be expressed, no human being could convince her that there was not something alive and moving within her. On examining the abdomen most attentively, it was impossible to say, from the extreme distention of its walls, whether it did or did not contain an enlarged uterus. The vaginal examination was little more satisfactory, as I could scarcely feel the os uteri with the extremity of the finger, there was such a depth of the parts, and she was so irritable under examination. Recourse was had to auscultation and percussion: by the assistance of the former, nought but a diffused intestinal murmur, with the puffing and borborygmus, could be distinguished; while on percussion, so decidedly a tympanic sound was emitted, as to leave no room to doubt of the cause of the swelling and other symptoms. The oil and turpentine draught was ordered for her, but she was prohibited by her husband from taking it for some time, lest, as she stated, the child should be injured. However, she did eventually; and the consequence was, that

the bowels were freely acted on, flatus and fæces expelled in considerable quantity, and all the symptoms of pregnancy vanished."

368 *b*. Some tumors give rise to a souffle (352). In these cases look out for the fœtal heart (358). Tumors never produce sounds like those of the fœtal heart.



AUSCULTATION IN MEDICO-LEGAL QUESTIONS.

INCE common law does not allow the death-punishment to be inflicted on a woman quick with child, the importance of accurate auscultation to decide whether a woman be pregnant, becomes manifest (Appendix B). So, it seems to me, that in our State where a woman is allowed to swear the paternity of a child upon any one, the law ought to allow at least of a stethoscopic examination. Not unfrequently are we consulted by young women, some wishing to deceive us, and others asking to know the truth about their condition as to pregnancy or not. In these cases auscultation will be of great use, and the skilful auscultator has vastly the advantage of the ignoramus (357, 363).

CEPHALIC AUSCULTATION.

CEPHALIC AUSCULTATION.



N July, 1832,* Dr. Fisher was examining a case of chronic hydrocephalus, and upon applying his ear over the open and pulsating anterior fontanelle, "he heard a bellows sound accompanying each pulsatory movement of the fontanelle, and synchronous with the pulsations of the heart." This was the origin of cephalic auscultation. Dr. F. continued his researches in persons of all ages, and gives as his results the following.

* This section I have obtained chiefly from the writings of J. D. Fisher, M. D., of Boston, as given in his edition of Laennec, Boston, 1838; from the article, published by S. S. Whitney, M. D., of Newton, Mass. in the American Journal of the Medical Sciences, in Oct. 1843; and, finally, from a review of a work on Hydrocephalus, published by Thomas Smith, M. D., in the Medico-Chirurgical Review, Oct. 1845.

371. Mediate or immediate auscultation may be used; but the latter is preferable to the former, as the ear can be easily applied to the head. The person ausculted should be in a horizontal posture, and the head should be covered with a napkin, and supported by a pillow. If it be a child the auscultation should be performed while the patient sleeps.

372. The first sound that will strike you in ausculting a young infant, is the noisy sound of respiration heard in the nasal fossæ, &c. It is called by Dr. F. *the cephalic sound of respiration*. This, of course, is modified by any swelling of the schneiderian membrane, and by tumors, &c.

373. The second sound seems to come from a distance. It is the sound of the heart, and is called *the cephalic sound of the heart*. These are the only sounds heard while the patient is at rest. If the child cries or speaks, the sound is transmitted generally sharply, and it appears to arise directly from the cranium. It is called *the cephalic sound of the voice*. It varies somewhat in its tones and apparent proximity to the ear in different parts of the head.

374. The sound of deglutition is likewise heard as we hear it frequently in auscultation of the chest. Dr. F. calls it *the cephalic sound of deglutition*. It is perceived best while the child is nursing.

All these sounds I have heard many times.

375. They are modified by growth and the density of the cranium and brain. The sounds of the heart especially become harsher and coarser, but more distant, by age. Dr. Fisher, at the time of his publication, had discovered that the cardiac sound was changed in various diseases into a bellows sound (223), hence called *the cephalic bellows murmur*.

376. The sound of the heart, also, in certain diseases, becomes *impulsive* instead of being *soft*, *near* and almost under the ear instead of *distant*. The *impulsiveness* Dr. F. considers the greatest peculiarity. It seems as if the brain were moved *en masse* against the interior of the cranium.

377. Subsequently to Dr. Fisher's publication, came the able paper by Dr. Whitney confirming all Dr. F.'s results, except in regard to the "*impulsive*" sound, which Dr. W. says he had never heard, though one of his own cases seems to prove the reverse.* Dr. W. has, moreover, extended the domain of cephalic auscultation by the addition of three new signs, viz. : the *cephalic hægophony*, the *purring thrill* or *fremissement cataire*, and the *cooing* or *musical sound*. The subject

* American Journal of Medical Sciences, Oct. 1843, page 310.

has been somewhat noticed by European writers, but they do not seem to have carried it forward. Dr. Smith appears to have studied it with closer attention than any one else.

377 *a*. I have given this brief historical account, because the subject is new, and I wish to bring it to your notice, as I am satisfied that it is worthy of your attention. I cannot, it is true, promise very much of a practical character, but a new field is open for you to study upon, and, moreover, the signs may sometimes afford useful hints relative to the nature of a class of diseases which now are as dark as any we have to deal with.

378. The following is the present state of the knowledge of the morbid sounds. *First. The Cephalic Bellows sound.* This may occur in *cerebral congestion* from any source. Dentition, hooping-cough, for example, are very apt to cause it. It is heard likewise in *acute cerebral inflammation*; *hydrocephalus*; *compression of the brain*; *scirrhus induration with softening*, *abscesses of the brain*, and *serum in its membranes*, *ossification of the arteries*, and the *hydrencephaloid disease*. It is evident that, of itself, (223, 225), it can be of little service in the present state of our knowledge, save that its absence, at least, is favorable. When it is present, it may serve to interpret other symptoms or those other symptoms may

interpret that. It never occurs in children before dentition, unless in actual disease of the brain.

379. *Second. The impulsive sound of the heart.* Dr. Fisher mentions, what he calls an *impulsive sound*, by which he means a sensation as if the whole mass of the brain rose and struck the cranium with each sound from the arteries. He has heard it in six cases of cerebral apoplexy, so that he thinks it may be a constant accompaniment of that disease. It seems to be with difficulty perceived. Dr. F. says that such is the case. Dr. Smith does not mention it, and Dr. Whitney states that he has never heard it. He contradicts himself, however, for he quotes a case which had it (377). That case was one of carcinoma and not apoplexy.

380. *Third. The cerebral hægophony.* This like the hægophony in the chest, depends on water either in or about the brain. Dr. Whitney distinctly says he has never heard it when the water was in the ventricles *alone*. Dr. Smith seems to have heard it in some largely distended ventricles. The name indicates the character of the sound (54).

381. *Fourth. The purring thrill* was felt once in a case of aneurism of the basilar artery. There was a continuous sort of *bruit de diable* (257) accompanied by a thrill like the purring thrill (206). The patient himself perceived it.

382. *Fifth.* A musical sound (224) is heard not unfrequently in anæmic cases. Cases in which a similar sound would be likely to be heard in the arteries and veins of the body (220), are liable to have this sound in the brain. In fact, it is considered by Dr. Whitney as strictly pathognomonic of anæmia.

382 a. From the above statements it will be readily perceived that, although, at present, cephalic auscultation will not enable you to make a very accurate differential diagnosis, it, however, will be frequently of some importance in marking permanent organic disease. It therefore should not be neglected.

AUSCULTATION,

AS APPLIED TO

OTHER DISEASES, FRACTURES, ETC.

AUSCULTATION IN FRACTURES.



O diseases of the ear, auscultation might be applied, by examining accurately the sound produced by forcing the air into the Eustachian tube in health, and comparing these with the variations produced by disease.

384. To fractures. It is surprising that no more use is made of this method in obscure cases of fracture; particularly in those of the hip joint, which sometimes, in aged persons, are very obscure. If the ear is placed over the part while an assistant moves the limb, a certain degree of crepitus must be produced (393).

385. It might be used in diseases of the bladder, or rather to distinguish them from calculi in

.

the bladder. When a stone is contained therein, of course more sound is produced by the striking of the catheter against it than against the walls of the bladder. I am not aware that it has been attended to by surgeons, and yet it seems to me that it might be of service, at least, occasionally.

385 *a*. Some have proposed to apply it to diseases of the abdomen. I have no doubt that the auscultation of the abdomen would lead to some curious results, but probably they could never equal those obtained from the thorax.

AUSCULTATORY PERCUSSION.

AUSCULTATORY PERCUSSION.



AUSCULTATORY

Percussion is the name given by Drs. Camman and Clark to a new method for investigating the diseases of internal organs. *Practically*, I know but little about it; I shall therefore,

in this section, depend chiefly upon the analysis of the article published by these gentlemen a few years since.* As the term implies, auscultatory percussion consists in a union of the two methods of examination.

387. In the paper above alluded to, the plan

* New York Journal of Medicine and Surgery, July 1840.

was applied chiefly to the discovery of the *dimensions of the heart*, and as that will afford an example, I shall consider the question chiefly with reference to that organ. The operation is as follows. You will place "the extremity of a cylinder of wood (396), cut in the direction of its fibres" flat over the centre of the heart, and support it there by your ear resting at the other extremity. Using for a plessimeter either your finger or an instrument adapted to the purpose (*fig. 24*, p. 40), if you will strike on the walls of the chest, about an inch from the extremity of the stethoscope, you will perceive "a clear, sudden, intense sound of high tone," attended with an almost painful, short, abrupt impulse, appearing to be immediately under the instrument or produced within it. Again, if you put the wood at the end of one of the diameters of the heart, and strike about three inches from it, i. e. at the other extremity of the diameter, you will obtain a similar result, but less energetic in degree. "Strike where the lungs overlay the heart, and you will find that the sound is instantly modified and mixed, but its *cardiac* type is preserved. Strike at still greater distances, moving by short steps towards the body of the lung, and at a certain point the sound will suddenly change, losing its intensity and high tone, and being no longer impulsive, but grave and distant. It will

likewise be heard much more distinctly by the open ear than by that applied to the instrument.

388. Explore, in like manner, the hepatic region, “and within short distances you will find that the sound will be clear, intense, and immediately under the instrument as before; but less intense, less acute, and more prolonged: it will be even semi-reverberant.” As the distance augments, the sound will diminish more rapidly than over the heart, though it will not be lost entirely until you shall get beyond the region of the liver and upon another medium.

389. The inventors of the system think, by this method, they shall be able to fix the boundaries of the heart and of all the other organs much more distinctly than by methods heretofore employed. In reference to the heart I think the common methods are sufficient where itself alone is diseased. But in cases in which there is disease of the adjacent parts, either of the chest or abdomen, and the dullness, resulting from the ordinary methods of percussion in such disease, is immediately continuous with that produced by the heart, this method may, I think, become a means of diagnosis, when we might find a difficulty with our other methods.

390. But in addition to this, it is *hoped* that by it we shall be able “to distinguish with facility serous effusion into the pericardium from any

form of disease of the heart itself." May it not likewise help us to decide in cases of a doubt as to the nature of a tumor : for example, between aneurism and a steatomatous or malignant tumor.

391. It is capable of being applied to the spleen, and kidneys, upon both of which organs the common methods of physical diagnosis are wanting in accuracy. Especially does it seem to me that it may be of great value in the recognition of organic enlargement of the kidneys.

392. In examining *the liver* Drs. Camman and Clark say, that they can follow it nearly an inch higher on the chest than by ordinary percussion ; they can trace its left lobe and its lower border to the extreme limits of its thin edge. They are able to limit the upper surface of the liver, when adjacent to a hepatized lung, or to an effusion into the right pleura. They limit the lower, thin edge of the organ while immersed in the serous effusion of ascites, and, finally, they can mark the line between the liver and spleen when both are enlarged and in contact.

393. It is hoped, likewise, that by auscultatory percussion we may be able to decide between *true and false anchylosis*. One case only had come under the notice of the inventors of the method at the time (1840) they wrote on the subject. In that case, there was supposed to be a perfect

bony union at the hip-joint, and the sound of percussion was transmitted, from the condyle of the former to the pelvis, more distinctly by the diseased than by the healthy limb.

393 a. In *fractures of the bones*, if the ends are in contact, the sound and impulse are transmitted; but if they are separated, both impulse and sound are chiefly lost. In the majority of instances, however, this method of distinguishing fractures cannot be relied upon.



TYPE SOUNDS.

THE following statement will afford an idea of the relative powers of different textures in the conveyance of sound by auscultatory percussion.

“We find, for example, that among the tissues of the body, bone is the best conductor of sound; that cartilage is but little inferior to bone in this respect; that muscle when tense is a good conductor,—relaxed, it hardly conducts at all; that fatty tissue uncondensed conducts badly; that œdematous cellular tissue has a

minimum conducting power; that any tissue or group of tissues under tension conducts better than when relaxed; that the spinal column is a bad conductor; that both sound and impulse are transmitted from one bone to another, through interposed soft tissues, if such tissues be condensed by moderate pressure; that articulations in a healthy state conduct both sound and impulse, but with loss of energy; that sound and impulse are not entirely lost in passing through two successive articulations; that fractures and dislocations do not in most cases wholly interrupt the conduction of sound; and that the sound is more intense than natural in passing through certain diseased joints.

“Some of these latter propositions deserve particular consideration. That bone should be both sonorous and conductive, might be inferred from its structure; but that sound should make its way through an articulation where it has to pass, first, from bone to cartilage, then from one cartilage to another, and lastly, from cartilage again to bone; and even where the transitions are still more numerous, as in the joints which possess “moving cartilages,” would have been anticipated only by a reference to two facts: first, the fundamental note of cartilage differs little from that of bone, (of this one may satisfy himself by examining the bony and cartilaginous portions of the same rib,)

and consequently vibrations produced in one are easily taken up and carried forward by the other : and second, the union between cartilage and bone in the joints is intimate, and between cartilage and cartilage the contact is firm. It is true that in every such transmission something is lost, but the loss is no way proportioned to the number of medial changes."

395. The authors of the system therefore propose as *type sounds* those heard over bone, water, the heart and the liver. The first, *osseous*, is the loudest and most energetic ; the second, *aqueous*, presents the least of these qualities, and are at opposite extremities of the scale. It may be remarked that fluid in the *chest* is difficult to distinguish by auscultatory percussion, owing to the sonorousness of the parietes being so great. To obtain the true character of the *aqueous* type therefore, it must be sought for in the abdomen, as in dropsy, for example. Between the *osseous* and *aqueous* come, first, the *cardiac*, and second, the *hepatic*. The former is acute, clear, less conductible than the osseous ; it is quick, immediate, intense, rather painfully impulsive, and gives, especially towards the circumference of the organ, a sort of muffled ring. The *hepatic* is graver, more continuous, less freely conducted by the organ over which it is heard, clear, intense,

immediate, impulsive.* With these types, all the varieties of sound and impulse, heard over different parts of the body, may be compared.



STETHOSCOPES FOR AUSCULTATORY PERCUSSION.



Fig. 35. SOLID stethoscope of two shapes is used in these investigations. They are as follows. *Fig. 35* is a solid cylinder of cedar, shaped in the direction of the woody fibres, six inches in length, and ten or twelve lines in diameter. It is furnished with an ivory ear piece, which will allow nearly the whole cylinder to pass through it. It will likewise serve for the common auscultation, but not so well as a hollow instrument.



* The following definition is given of these terms.

Immediate, when apparently applied immediately to the end of the stethoscope.

Abrupt, opposed to *prolonged*, &c., refers to the sudden termination of the sound or impulse.

Distant, opposed to *immediate*, impulsive.

Quick, used as when the same term is applied to the pulse.

Acute, as opposed to grave in the diatonic scale.

Impulsive, causing a shock to the ear.

397. A modified form of this may be used when examining the chest in order to avoid the sound of the bony parietes. It is made in the form of a truncated wedge, (*fig. 36*) leaving the aural extremity as before. The narrow end is two lines wide and can be easily placed in the intercostal spaces.



398. In case we have not these, the common stethoscope *may* be used (19).

399. Finally, a plessimeter is absolutely necessary. The finger will answer all purposes; but another has been suggested (*fig. 37*). It is made of steel with an ivory handle and place for the thumb to press upon. The part used in percussion is of steel and oval, containing a small piece of india-rubber (88).



DIFFICULTIES OF AUSCULTATORY PERCUSSION.

DIFFICULTIES, that require some notice, are met with in auscultatory percussion. They apply chiefly to the heart, but they are suggestive with regard to the examination of all other organs.



401. *First.* To get the full, characteristic sound of the heart, the stethoscope must be placed on a part of the chest with which the organ comes in contact. Even the lung lying over the heart may interfere seriously with a novice in the art.

402. *Second.* The difference between the heart and the liver may not be easy to perceive. The fundamental sounds of the two organs differ but two notes and a half on the diatonic scale in the structure of their parenchymata, and they have similar degrees of consistency. The sounds are transmitted from one to the other, but they change from acute to grave, and lose a part of the impulse. Practice will overcome this difficulty.

403. *Third.* It is, at times, difficult to define the right side of the heart, owing to the sternum lying over it. By using the wedge we may generally avoid this.

404. *Fourth.* The conducting power of the ribs sometimes embarrasses the exploration of the heart. The wedge assists in this case likewise.

405. *Fifth.* Emphysema may make the chest very sonorous, and cause the lungs to cover the heart. In this case the wedge or a stronger pressure with the cylindrical stethoscope will generally overcome the difficulty.

405 *a.* *Sixth.* The mammæ in females may become a source of error, but we can generally push them aside as in common percussion.

406. *Seventh.* Percussion may be too hard, so as to confuse and fatigue the ear of the auscultator. It should be performed with the single finger, and so feebly as to be scarcely, if at all, audible to a bystander.

VETERINARY AUSCULTATION.

VETERINARY AUSCULTATION.



VETERINARY Auscultation seems to have been much neglected in England, and is wholly unattended to in this country, a fact which is by no means creditable to us on the score

of veterinary science or of humanity.

408. There are certain general ideas which every physician must have who is at all acquainted with auscultation in the human subject. These ideas depend upon his knowledge of the diseases of the thoracic viscera in the human subject, and the sounds produced by these diseases. Similar diseases are found in animals, and, of course, similar auscultatory phenomena must occur. The following remarks on veterinary auscultation are merely *supplementary to what I have given on human auscultation.*

409. I have examined many healthy horses, and have found the respiratory murmur to be usually quite as distinct as in man, and of the same breezy character. The heart also has two sounds as in man. They are very distinct, but they are not so different from each other, as it seemed to me, as those in the human subject (461).

410. In the following account of the auscultatory phenomena in diseases of animals, especially of the horse, I depend chiefly on what Mr. Youatt* and Mr. Percival † say, premising, however, that they seem to derive much of their confidence in auscultation from the writers of the French school, Delafond, Girard, D'Arboval, &c., whose works I have been unable to procure.

* *The Horse*, by William Youatt, a new edition, &c., by J. S. Skinner, Philadelphia, 1845.

† *Hippopathology, a Systematic Treatise on the Diseases and Lamenesses of the Horse, &c.*, by William Percival, London, 1840. Also, "The Veterinarian," for April, 1840, a lecture on Auscultation by the same author.



PERCUSSION IN VETERINARY PRACTICE.



R. DELAFOND uses mediate percussion, one of his hands being the plessimeter (83, 84). Some use a wooden plessimeter, and a mallet covered with india-rubber. Delafond says that, for all common purposes, immediate percussion is sufficient ; if you remember to strike, first, perpendicularly to the surface sounded ; second, to strike the ribs and not the intercostal spaces ; third, to use the same force every where ; fourth, to compare the two sides of the chest (4, 84).

412. The portion of the trunk in which percussion may be advantageously used, may be marked by two lines, one let fall just back of the posterior edge of the scapula, the other in the direction of the last rib. Divide this space by two horizontal lines into three equal parts, which may be called upper, lower and middle (1, 2, 3, in *fig. 38*). The upper, 1, extends from the scapula to the last rib, along the border of the longissimus dorsi, and includes the superior third of the ribs ; the lower, 3, includes the inferior third ; the middle, 2, the central third (*Fig. 33*, p. 224).

413. Percussion affords the loudest sound in the middle region, between the seventh, eighth, and ninth ribs; from this to the fifteenth it diminishes, and again, owing to intestinal distention, increases to the last rib. On the right upper region, the sound grows louder from the posterior border of the shoulder to the last rib, whilst on the left it gradually diminishes on the same line. This is explained by the arch of the colon extending far into the chest.* In the lower region the sound obtained may be compared to that of the upper region behind the shoulder; and this continues to the ninth rib, whence it lessens until it becomes abdominal. On the right side the sound is a little duller, owing to the liver.

414. For the various modifications of sound, I would refer you to 89, &c. to 101.

* Delafond, in Percival's Hippopathology, page 68.



VETERINARY AUSCULTATION.

IMMEDIATE auscultation is better than mediate (18). Apply your ear accurately, but lightly. The quietness of the night is the best time. Let the animal be amused with a little hay, unless the chewing obscure the sounds. There is the puerile or juvenile respiration as in man (25), and the murmur diminishes in age. It is augmented by exercise. It resembles entirely the sound heard over the human chest.

416. In the following plate the chest is divided by two parallel lines, forming upper, middle and lower regions, as described (412).

Fig. 38.



417. In the *upper region*, 1, the respiratory murmur is quite distinct.

418. In the *middle region*, 2, it is also very distinct from behind the shoulder; thence increasing a little to the ninth rib, and after that diminishing to the last rib.

419. In the *lower region*, 3, the sound is quite manifest from the elbow to the ninth rib, whence


it diminishes to the seventeenth and there disappears. It is the same on both sides except in the place of the heart. This is immediately back of the left shoulder and marked 4, and there, of course, the murmur is diminished. It is the best place to hear the heart; although it may be perceived at 5. The middle of the trachea is at 6, and it may be an important place for auscultation (438).

420. We must be careful, so Percival says, not to confound the sound produced by the contractions of the panniculus carnosus muscle with the sounds made within the thorax. I have never found any difficulty on that score, as these sounds are essentially distinct, and occur at different times.

421. Among the peculiarities resulting from the position of the horse, is the existence of a strong supplementary respiration along the spine in cases of pleuritic effusion, owing, first, to the lungs being forced there, and, second, to those portions of them being obliged to do a double share of duty in consequence of the compression of the lower parts.



RALES IN VETERINARY AUSCULTATION.

ALES are heard in animals as in man; they have the same general characteristics, and are indicative of the same diseases as in man. For these sounds as heard in man, I refer you to the former part of the work (62, &c.). The following peculiarities in veterinary auscultation, as given by veterinary writers, are worthy of notice. In *bronchitis* the mucus, at times, is so adhesive, especially at the lower part of the organ, as to clog up a bronchus, (as it does sometimes in man, 113), and cause absence of respiration, "leading one to believe that there is hepatization of the lung." If you trot the horse under these circumstances the mucus is dislodged. I would add, that percussion would likewise assist in the diagnosis in such a case, as there would be dullness in hepatization (123), whereas there would be no change of sound in simple obstruction of the bronchial tubes. Bronchial respiration (123) also would probably exist in hepatization, but not in the other case.

423. In pleuritic effusion, *bronchial respiration* (41) is heard more frequently than in man. It occurs on a level with the upper edge of the lower division (*fig. 38*), and at the same level on both sides, *usually*, in a horse; but on one side only in dogs and ruminants (owing to the different construction of the mediastinum in the horse and these others).

424. In *acute pleurisy*, bronchial respiration (134) is likewise said to be heard; but it is very short and quick, owing to the rapid and painful efforts of breathing made by the animal; and being accompanied by "a confused sort of noise," its detection is very difficult.

425. *Pulmonary emphysema* (180), it would seem, is a more frequent cause of râles, *crepitation* (76), than it is in human beings. They are most distinct in expiration.

426. *Pleural sounds* (77). A rumbling is heard when there is air and fluid, or when there are a fluid and false membranes, so as to make many little cells between the layers of the pleura.

DISEASE OF THE NASAL CAVITIES.



TUBAL sound is heard in the nasal cavities in health; but a swelling of the schneiderian membrane, or a polypus will contract their calibres, and produce a whizzing or whistle (62, &c.). Sometimes, these sounds are continued even into the chest, but they are strongest opposite the part affected.

428. *Percussion* may be of use in indicating polypus; dullness resulting from any solid substance in the cavities.

DISEASE OF THE FRONTAL SINUSES.




x auscultation in health we hear only a very slight murmur. But when the membrane is swollen there may be whistling (62); or if the swelling be very great, and thick pus be effused, all sound may be absent.

430. *Percussion.* The resonance is tolerably clear in youth, more so in the aged. In disease it may become perfectly flat.



DISEASE OF THE LARYNX.

OUNDS of the slightest character, but necessarily tubal (42) in their nature, are heard over the larynx while it is in a normal condition. In disease the râles heard there may become very important (103). Le Blanc* mentions the following.

432. First, the dry whistle, from simple contraction of the calibre of the tube, either from natural conformation, compression, or some lesion, physical or vital, of the recurrent nerve.

433. Second, a humid whistle (63), caused by a swollen membrane, covered with mucus. This is sometimes intermingled with the mucous, and sonorous râles as in man (62, 71).

434. Sometimes the mucous becomes a loud gurgling (74), so that it is heard at a distance from

* Hippopathology, vol. ii, p. 67, see above.

the animal. If it is so loud as to make you suspicious that there is disease of the lung, put your ear at the lower part of the neck, and if you find the air passes freely in and out, Mr. Youatt* says you may be sure that there is "no disease of the trachea or lungs,"† but on proceeding up the neck the sound of gurgling will become more manifest, and, finally, over the larynx it will be very loud.

435. *Percussion* gives no results in this disease.

436. *Cough*. The veterinarians say nothing of using the cough as a means of diagnosis; but I think it might produce a rattle, or augment one already existing, and therefore might be of service.

* The Horse, &c., p. 193, see above.

† I doubt much whether Mr. Y. is not in error in this broad assertion. He may say that there is no disease of the trachea, but certainly the fact that the air enters the trachea freely is no proof that the lungs are healthy. The latter part of his direction is excellent, viz.: to trace up the course of the wind-pipe.

DISEASE OF THE TRACHEA.



ISTINCT *tubal* (39) sounds are always heard on auscultation along the under part of the neck of the healthy horse, i. e., in the course of the trachea (*fig. 38*, p. 224).

438. The *sibilant*, *sonorous* (62) and *mucous râles* (71) may all be heard in diseases of the trachea; owing either simply to a dry contraction of the tubes or to bands of coagulable lymph, partially obstructing it, &c. In these cases we not unfrequently have the disease called *roaring*. It is so called, because, during the act of inspiration, and when the animal starts suddenly to trot, the air enters with difficulty, and of course, a sound is produced, which sometimes becomes so loud as to be very unpleasant to the rider, and makes the animal of less value; although it may not really injure his health or powers of locomotion. The far-famed Eclipse is said to have been a "*roarer*."

439. It has been necessary, at times, to perform the operation of tracheotomy for it, and whether for this cause or any other obstruction,

you find it necessary to do this operation, the ear may enable you to decide the spot where the obstruction exists.

440. *Percussion* gives no results.

441. The *cough* may be of service by removing, altering, or demonstrating the position of the obstruction, when by the respiration we cannot decide.



BRONCHITIS IN ANIMALS.



RALES varying according to the amount of the disease, are heard in most cases. When the membrane is simply inflamed, with no secretion, there may be simple wheezing, running into the sonorous (62). The veterinarians do not mention the spot, but judging from analogy (which, by the by, is often an unsafe guide), I should expect that the râles would be most distinct towards the sternum, or depending parts of the chest, and more or less in both lungs. If there is general bronchitis, the râles, I think, should be most conspicuous at these parts, and

grow less towards the withers or spine. On the figure (416) they would be most manifest in 3, thence through 2 to 1.

443. *Percussion* teaches nothing.

444. The *cough* may be of service in bringing out a râle in case there is but little sound of it, or destroying the rattle that is heard, in either case showing the disease to be in the bronchi chiefly, and not in the parenchyma of the lungs. (See bronchitis in man, from 105 to 117).



PNEUMONIA IN ANIMALS.

IT seems singular, but neither Mr. Youatt nor Mr. Percival give any but the most vague directions in regard to *auscultation* in this disease. The crepitous râle (70, 120) is mentioned as occurring, and being evident, and as distinct in its characters as the same sound in human beings. Around the inflamed part the respiratory murmur is frequently augmented.*

* Percival's Hippopathology, p. 74. 81.

446. *Bronchial respiration* (41, 123) is likewise observed, but the veterinarians are rather obscure on this subject also.

447. *Percussion*. Mr. Youatt says nothing of this method of examining. Mr. Percival quotes from Mr. Rigot, in which he gives the following very clear account. “*The impermeability of the lung prevents us from hearing the respiratory murmur, by causing a dullness of sound on percussion, opposite the diseased parts.*” A sentence which proves that neither Mr. Percival, nor his authority, had very definite views of what they were writing upon. We however gain one point which analogy and physical laws would have told us previously, viz.: that hepatization of the lungs in a horse causes dullness on percussion, as in a man (98, 123). Reasoning from analogy, I should think the signs would be most frequently manifested in 3 (*fig.* 38, p. 224).

448. The *cough* might be used, as I have mentioned above, and I suspect instead of the voice as a test of disease, and might become equally important with *bronchophony*. (See pneumonia in man, 117, &c.).

BROKEN WIND IN ANIMALS.

IN veterinary medicine, broken wind is considered by writers as a kind of emphysema (175). Mr. Percival agrees to this remark by Mr. Youatt, but says it may result from injury of the pneumogastric nerve, lesion of the diaphragm and pulmonary inflammations.

450. *Auscultation.* Respiratory murmur very quiet (178).

451. *Percussion.* Chest more resonant than usual (177).

452. *Inspection.* Chest rounded; intercostal spaces prominent (176).

All these signs may be general or local.

453. In addition to these, Mr. Percival speaks of a rubbing sound occurring in this disease. Laennec observed it in this disease in man. Later writers have doubted it. It undoubtedly occurs, at times, in man. Does it occur more frequently in veterinary practice? I cannot answer the question.

454. Yet further. A sign mentioned by Percival as occurring in local vesicular dilatation,

corresponds somewhat with what, according to Laennec, occurs in dilated bronchi, viz.: a dry crepitous râle. It is certainly a very rare phenomenon in human beings, but may be more common in veterinary auscultation. Analogy suggests that we should find sibilant and sonorous râles more frequently in broken winded animals than in others (180). (See emphysema in man, 175, &c.).

PHTHISIS IN ANIMALS.



UBERCLES are found most commonly at the anterior and superior parts of the lungs (143), near the withers of the animal.

456. *Auscultation* shows a diminished respiratory murmur (149) in the earlier stages and râles (156), similar to those in man at the later stages of the disease, where cavities, &c. exist.

457. *Percussion* affords its modifications of sound in the same way as in man (146, &c). I do not know that the *bruit de pot fêlé* has been

ever heard (148), but I see no reason why it should not be heard in brutes as well as in man.

458. The *cough*, though no notice is taken of it by the veterinarians, must be an important aid in recognition of râles. (See phthisis in man, 144, &c.).



PLEURISY IN ANIMALS.



USCULTATION shows a diminished respiration (132), and, at times, a rubbing sound (128), especially at the upper part of the chest, as the early signs of pleurisy, with merely roughness of membranes, and perhaps some slight effusion of lymph. But, within three days, gallons of fluid may be effused, and, of course, the lung will be pushed away from 3 (*fig.* 38, p. 224) and the respiratory murmur be wholly gone. It is said that, at times, a sound like that of the dashing of water is heard. It seems to me that there must be air as well as water, in order that this sound should be heard (164).*

* Hippopathology, p. 116.

460, *Percussion* will afford, of course, but little dullness in the early stages, but when any effusion has taken place, you may find an extensive dullness varying with the amount of fluid (101, 131). It will commence at the sternum and extend upwards. It will be much more difficult to determine whether one or both pleuræ are affected in the horse and ox than in the dog; because in the former there seems to be a communication through the mediastrium, allowing the fluid of one side to get into the other. Mr. Percival describes a case in which distinct fluctuation was communicated to the ear placed on the affected side, while percussion was made on the other (14).* (See pleurisy in man, 128, &c.).

* Mr. Percival speaks of having heard in one case a dull rumbling sound as of fluid in a barrel.

CARDIAC DISEASES IN ANIMALS.

Mr. Percival follows Dr. Hope in his description of the sounds of the healthy heart (210). The place for hearing and feeling this organ is just on the ribs and behind the elbow of the left side, in the small space marked 4, (*fig. 38*, p. 224). The hand, placed flat against the ribs there, will recognise the pulsations of the heart (240).

462. *Pericarditis*. Mr. Percival gives the symptoms as they occur in man as those which it will be "well for veterinarians to set before them until, from observations on their part, they are able to confirm or reject them." Mr. Youatt gives nothing more definite than this, viz. : a bounding action of the heart early in the disease, a confused and feeble, fluttering movement, when effusion takes place. To the experienced auscultator of man, all this means much less than he knows already. (See *pericarditis* in man, 258, &c.)

463. *Carditis* and *endo-carditis* are evidently not recognised by the veterinarians; though I do not think that they are, by any means, unrecog-

nisable by one accustomed to human auscultation. (See carditis and endo-carditis in man, 269, &c.).

464. *Hypertrophy of the heart.* Mr. Percival again takes the common classification of simple, concentric and eccentric hypertrophy. But nothing new is stated, either by him or by Mr. Youatt. (See hypertrophy in man, 275, &c.).

465. *Dilatation of the heart.* (See dilatation in man, 277, &c.).

467. *Disease of the valves.* This is evidently a new subject to the veterinarians. Nothing is given upon the subject. Yet it is perfectly evident that, as the same physical conditions may exist, so the same physical signs may be heard (283, 289, 294, 297, 302, 307).

468. *Aneurism.* Of this, Mr. Percival says, "it has never become the object of veterinary practice." Judging from what we know of the results in human pathology, I cannot but think that the veterinarians would do well to make it an object of study forthwith, in order that no one hereafter may open one with a lancet, as Mr. Percival says was actually done by a veterinary surgeon.* The diagnosis of this disease in horses must be very important, whether it occur in the trunk or extremities, for either would make the animal un-

* Hippopathology, p. 70.

sound. When in the former, he would be, of course, incurably so; when in the latter, an operation might relieve entirely. (See aneurism in man, 335).



VETERINARY UTERINE AUSCULTATION.

SOUNDS of the foetal heart may be heard as in the human subject. I have never listened to them however, and the only very obvious use to which, as it seems to me, that auscultation of the uterus in animals can be applied, is to the discovery whether or not a mare is with foal. This is a very important item on many occasions and for many reasons. (See foetal heart 358).

470. Percussion, also, is important as marking the size of the womb, and may be practised previously to auscultation in order to accustom the animal to examination.

471. In all these examinations, great caution should be observed to avoid injury from the animal, which frequently becomes restive under this operation.

APPENDIX.



A, page 16.

STETHOSCOPES.

472. SOME few months since, a friend gave me one of the stethoscopes used by Dr. C. J. B. Williams of London, and it soon proved the truth of two assertions made by that gentleman at the meeting of the British Association, in 1842, and subsequently published in the Medical Gazette for December of the same year. In the first place, it was the most perfect instrument I ever used for its delicacy in conveying sounds, and I enjoyed it much while it lasted ; but, in the second place, it was unfortunately too fragile and was soon broken.

The following plates represent the stethoscope, together with his plessimeter and hammer.

Fig. 1 represents the instrument, prepared for use.

Fig. 1. It is made of soft sycamore wood. *Fig. 2.*



It is hollow; has thin parietes, and a trumpet-shaped mouth. *a* is a moveable ear-piece, which can be introduced into the other end of the tube, as represented in *fig. 2*, to make the instrument more portable and less liable to receive injury in the pocket; or



it may be placed on the chest, while the ear may be applied to the trumpet-mouth of the instrument, when we wish to examine the voice. To do this the stethoscope should be arranged as in *fig. 1*.

Fig. 3 is a percussor or hammer made of a rod of

Fig. 3. whale-bone, four or five inches long, and having an oblate spheroid of lead, three quarters of an inch in its long diameter, fastened to one extremity. This lead is



covered with buff leather and velvet, to deaden the sound. *Fig. 4* is a plessimeter, made of a stout narrow piece of

Fig. 4.



whale-bone, about four inches long and slightly bent by heat, so that one end forms a handle, whilst the other, covered with leather and velvet, fits readily between the ribs and can be firmly applied.



B, page 190.

AUSCULTATION IN MEDICO-LEGAL CASES.

473. *First.* Among the most deplorable cases on record, in which innocent human life was deliberately taken, according to legal forms and by the adjudication of the supreme tribunals of the land, that of the child of Mrs. Spooner, who was executed July 2, 1778, stands preëminent. Under our modern means of diagnosis of the earlier periods of pregnancy, especially with our knowledge of obstetric auscultation, such a case I presume will never happen again. It impressed me most deeply, for many reasons ; but I quote it now because it may stimulate you to the study of the minute stethoscopic phenomena of early pregnancy. You may at any time be placed in circumstances in which the knowledge of these may be of the highest importance to you. Mrs. S. was convicted of having been an accomplice in the murder of her husband, and after having been condemned she begged a *reprieve*, on the ground of being “ several months advanced in pregnancy.” The execution was stayed one month, and the court ordered a jury of “ matrons,” or, in other words, of ignorant old women to be summoned to decide on the question, whether or not she was “ quick with child.” This

practice, a relic of antiquated absurdity, was put in execution, and these twelve *matrons wise in medical diagnosis!* with two men midwives, decided that she was *not* "quick with child."* Mrs. Spooner immediately sent to the Council a most touching petition in which she says, "although the jury of matrons have not decided in my favor, still I am absolutely certain of being in a pregnant state, and above *four months* (363) advanced in it, and the infant I bear was lawfully begotten. I am earnestly desirous of being spared till I am delivered of it. I most humbly desire your honors, notwithstanding my great unworthiness, to take my deplorable case into your compassionate consideration. What I bear and clearly perceive to be animated, is innocent of the faults of her who bears it, and hath, I beg leave to say, a right to the existence God has begun to give it. Your honors' humane, *Christian*, principles, I am very certain must lead you to desire to preserve life, even in this, its miniature state, rather than to destroy it. Suffer me, therefore, with all earnestness, to beseech your honors to grant me such a further length of time, at least, as that there may be the fairest and fullest opportunity to have the matter fully ascertained, and, as in duty bound, shall, during my short continuance, pray." Notwithstanding this urgent appeal of a mother in behalf of her innocent unborn babe, the honorable Council of Massachusetts ordered her execution, and thus inflicted a stain that can never be erased from the annals of the jurisprudence of the State ; and they

* American Criminal Trials, by Peleg W. Chandler, Boston : T. H. Carter & Co., vol. ii. 1845.

did so, notwithstanding that two men midwives and one of the "*matrons*" certified that they believed that Mrs. S. was quick with child, and that they had been mistaken in the verdict they had previously given! It was sufficient that "Elizabeth Rice and Molly Tattman" certified to the contrary, and that they believed her to be "not even now (June 27, 1778) quick with child."

With indecent haste, amid the fury of the elements, and the shouts of the crowd, this legal murder was consummated. On the evening of the day of the execution, the "body was examined, as the prisoner had requested, and a perfect male fœtus of the growth of five months was taken from her"!

As I have already stated, I quote this case chiefly to show the importance of every sign of early pregnancy in medico-legal questions. I have no hesitation in believing that, had auscultation been known and practised on that occasion, it would have revealed the existence of the sounds of a fœtal heart, and this sad event would have been prevented. Does not the reverse of the fact prove to the medical student the importance of accurate obstetric auscultation? For though we have improved somewhat in the forms of jurisprudence during the last seventy years, we are still liable to have the folly of a *matron* jury enacted over again by the advice of the wisest on the bench. The student of medicine ought always to protest against such an absurdity, and to claim for the auscultatory signs their relative and important place among the phenomena of early pregnancy.

474. *Second.* It may be your fate to be called upon, as physician of a prison, to state whether or not a pris-

oner has such disease of the lungs as to render his longer sojourn in confinement absolutely detrimental to life.

In like manner, the army and navy surgeon is always liable to meet such cases among the soldiery under his charge.

In all such circumstances auscultation may become of infinite value to you.



C, page 186.

AUSCULTATION DURING LABOR.

475. I might have mentioned the possibility of discovering the existence of two fetuses by means of auscultation. If there is double pregnancy, we, of course, shall hear a fœtal heart beating in two distinct, probably opposite, places of the abdomen.



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The following corrections should be made in the Index.

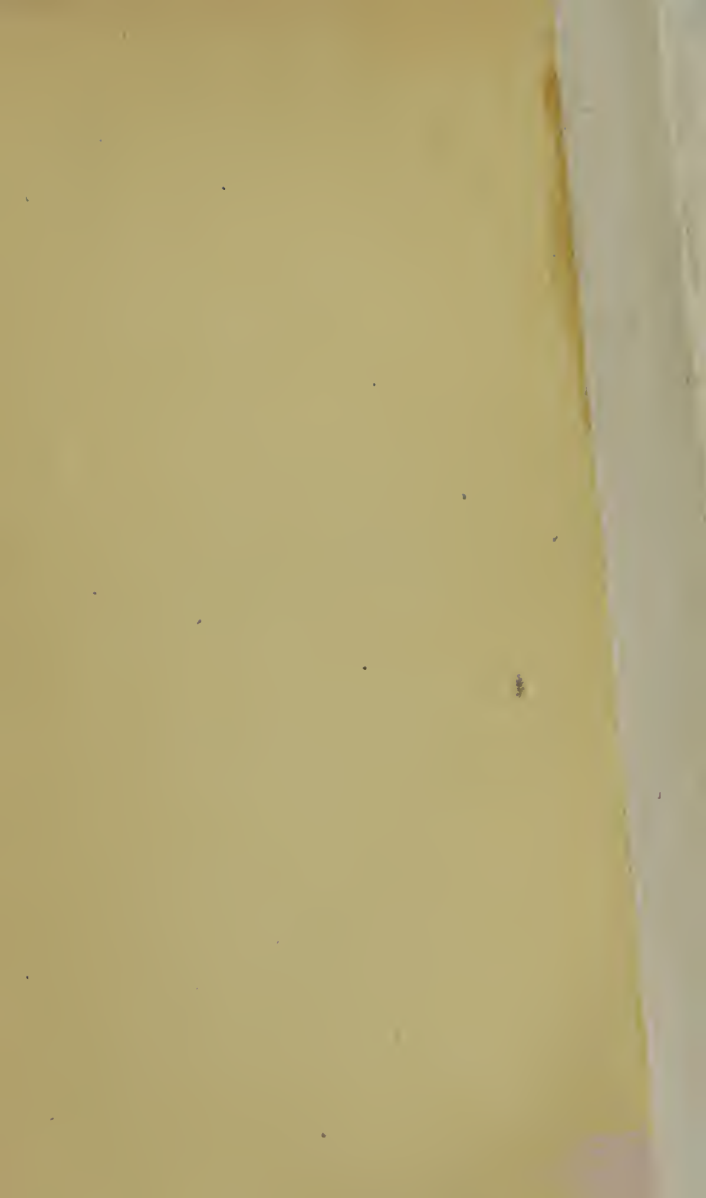
Page 250, after “cardiac in health,” 93 should be 95.

Page 254, after “cyrtometer, &c., 93 should be 95.

Page 255, after “Dress,” &c., 1. 89 should be 1. 91.

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